THE GEOGRAPHY OF THE EUROPEAN POTASH INDUSTRY

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THESIS

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THE GEOGRAPHY OF THE EUROPEAN POTASH INDUSTRY

Introduction

The period during and since the World War, or better probably since 1910 when the potash industry came under the supervision of the German Government, has witnessed the production of much literature on the past, present, and future of the potash industry. This was the result partly of the monopolistic character of that commodity, a status which brought endless embarrassment to many nations during the war, partly to the realization that potash is essential for supplying the food requirements of an ever increasing population. We have come to a stage in our agricultural development where the use of potash as a fertilizer has become indispensible over large areas, and adequate supplies of this mineral must be obtainable at figures that can be met by the agriculturalists. The sodium salts can replace potassium salts in many industries, but as a fertilizer, potash has no substitute. Its great usefulness plus the limited distribution of the potash deposits gives this commodity a very prominent place in international trade, and thus its availability is of the utmost concern to the world at large.

Many years ago potash entered commerce under the name of "Indian Saltpeter". The name "potash" was first used when this substance was prepared by evaporating a solution of wood ashes in iron pots - the name thus designating a particular

product. The term potash[1] now includes practically all of the potassium salts. Potassium oxide or "pure potash" (expressed as K_2O) has been designated as the commercial standard or unit[2], and although it is not generally used or sold as such, it is the unit to which all of the commercial salts, particularly potassium sulphate, potassium chloride, and potassium carbonate are reduced. Consequently all determinations of the potash content of any potassium compound are expressed in terms of potassium oxide (K_2O) rather than in those of the derivative salts.[3]

(1.) "Considerable confusion arises from the somewhat illogical use of the word "potash" now imposed by convention. To the lay mind, potash is potash, whether it be in the form of 12 per cent German kainite or of 98 per cent American muriate. But in reporting results of analysis of potash carriers and in quoting prices of potash salts, it is evident that some standard basis of computation must be adopted. The 12 per cent and 50 per cent salts cannot be sold at the same price. The standard now in common use is the oxide of potassium, K_2O. Unfortunately this is a hypothetical compound and is never encountered as such. So every potash salt, even though it be 100 per cent pure, must be recalculated to its equivalent of the hypothetical oxide, K_2O. This then is "potash" in the strictest sense of the word, though where it is essential that an exact meaning be conveyed, it is frequently expressed as "actual potash"".Turrentine, J. W., Potash: A Review, Estimate, and Forecast, p. 3.

(2.) "Another term in common use in the fertilizer trade, but confusing to the layman, is the word "unit". Its meaning may be defined as "one per cent per ton", or in terms of weight "20 pounds". To illustrate, a potash salt analyzing 50 per cent actual potash (K O) is spoken of as containing 50 units of potash and may be quoted at so much per unit. Thus if quoted at 75 cents per unit, its price per ton would be $37.50. This term is in general use in designating the concentration of elements of plant food value in commercial fertilizers and is made the basis of guarentee and price". Turrentine, J. W., Potash: A Review, Estimate, and Forecast. p. 3.

(3.) Hoar, H. M., Potash: Significance of Foreign Control and Economic Need of Domestic Devlopment, United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Trade Promotion Series - No. 33, p. 42.

CHAPTER I

POTASH - ITS SOURCES, OCCURRENCE, AND USES

Sources of Potash. Potash is a very abundant mineral, but unfortunately in most places it is chemically combined in such a form as to be difficult of extraction, and the deposits from which it can be extracted at a reasonable cost are concentrated in but few places. The sources of potash may be roughly classified as follows:

1. Solid deposits of soluble potash minerals, such as carnalite, sylvinite, and kainite.
2. Sea-water, brines, and salt-lake deposits containing appreciable amounts of potash salts associated with sodium salts.
3. Vegetable substances, such as wood ashes, beet-sugar residues, seaweed, and sunflower stalks.
4. Animal material, such as wool washings.
5. Products resulting from the decay of organic nitrogenous matter, such as Indian Nitre.
6. Dust carried in flue gases from the manufacture of cement and iron.
7. Insoluble minerals, such as alunite, feldspar, and leucite.[1]

The soluble potash minerals are by far the most important, and because of her pure, readily accessible, and enormous deposits of

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(1.) Johnstone, Sydney J., Potash. Monograph on Mineral Resources with Special References to the British Empire, Scientific and Technical Department, Imperial Institute, p. 2.

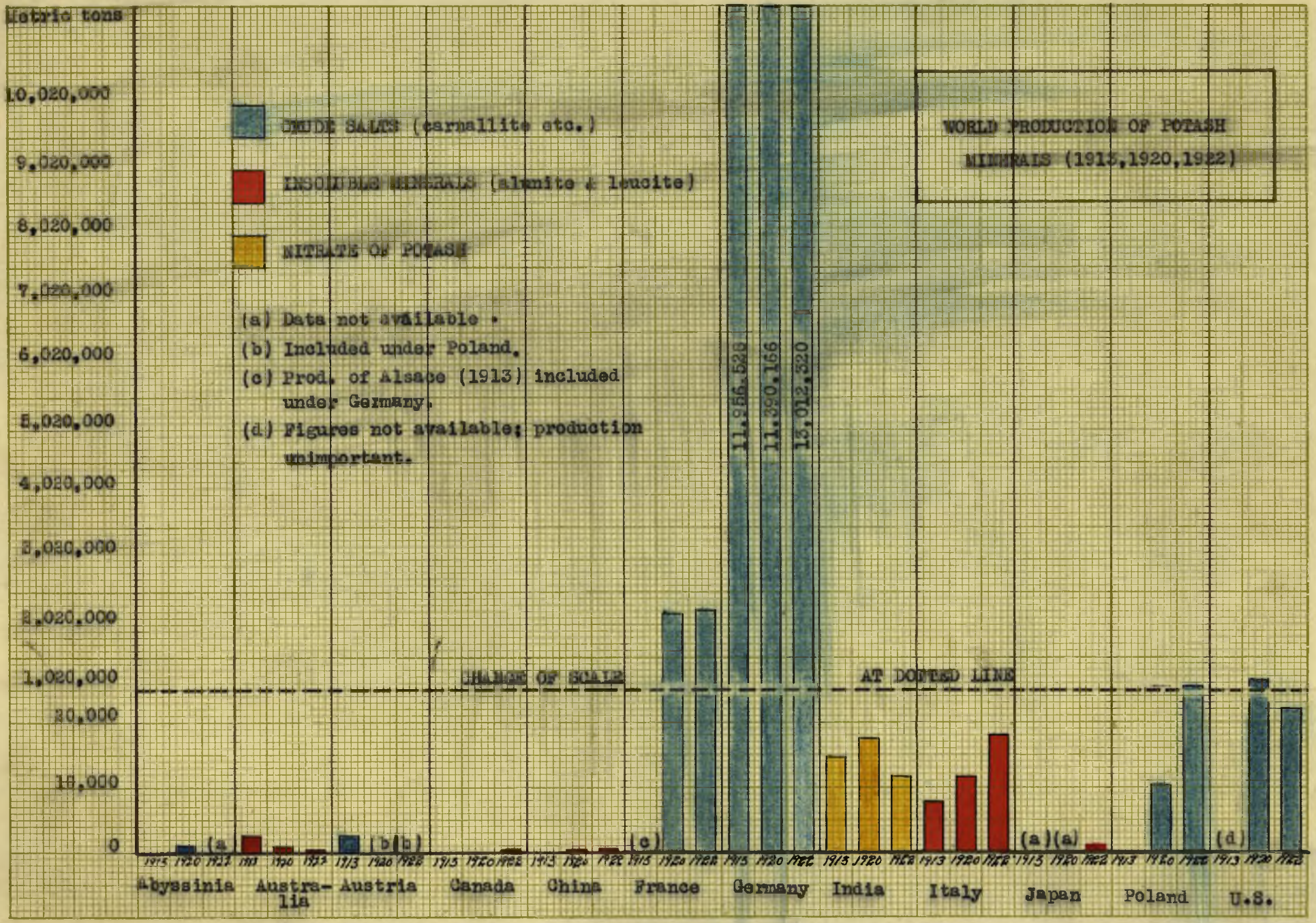
Metric tons
10,020,000
9,020,000
8,020,000
7,020,000
6,020,000
5,020,000
4,020,000
3,020,000
2,020,000
1,020,000
20,000
10,000
0
CRUDE SALTS (carnallite etc.)
INSOLUBLE MINERALS (alunite & leucite)
NITRATE OF POTASH
WORLD PRODUCTION OF POTASH MINERALS (1913,1920,1922)
(a) Data not available.
(b) Included under Poland.
(c) Prod. of Alsace (1913) included under Germany.
(d) Figures not available; production unimportant.
11,956,528
11,390,166
13,012,320
CHANGE OF SCALE AT DOTTED LINE
Abyssinia
Australia
Austria
Canada
China
France
Germany
India
Italy
Japan
Poland
U.S.

Fig. 1.

this mineral, Germany, till the close of the World War, was able to exercise all the privileges of a natural monopoly. Before its discovery in 1859, the chief source of potash, other than the natural manures, had been wood ashes - the production of which naturally had been small, due to the decreasing supply of the raw material. Potash exists in one form or another throughout the world, and the various countries realize the desirability of having adequate supplies within their own territorial confines. In many instances they have made strenuous efforts to obtain a domestic supply, but most of them have had indifferent success. With the exception of Spain and Poland, where potential deposits that may be significant in the future exist, little or no potash enters in world trade which is not of Franco-German origin.[2] Figure 1 showing the world's production of potash minerals and content of K_2O (in metric tons) for 1913, 1920, 1922, verifies this statement.[3] A study of Figure 1 shows:

(a) The dominant position of Germany in the production of potash before and since the World War.

(b) The position of France (since the War) as a serious competitor in the world's potash market.

(c) The increase in the potash production of various countries brought about by the war, and their decline, with the exception of Poland and Italy, in 1922.

(2.) Concannon, C. C., Potash in World Trade, American Fertilizer, October 2, 1926, p. 27.

(3.) Data from Mansfield, G. R., and Boardman, L. Potash, Mineral Resources of the United States 1924, Pt. II, p. 57.

(d) The insignificance of the insoluble minerals and the nitrate of potash as sources of potash.

The comparatively small production of the insoluble minerals, as shown by the graph, seems to substantiate the statement made by Johnstone, namely, that the employment as fertilizer of minerals containing insoluble potash compounds is not likely to prove remunerative, unless the material is available in large quantity at a low price, and that even under such conditions they might not prove satisfactory.[4]

Occurrence and Mining Technology of the Potash Deposits. As has previously been stated, potash is an abundant mineral, but in most places it is difficult to extract. However, in Germany and Alsace the mining of potash is highly profitable because of the enormous extent, the accessibility, and the purity of the salt deposits. Fig. 2 is a cross section of a potash mine in Germany, which definitely shows the occurrence and accessibility of the deposits.

The potash-bearing strata of the German and the Alsatian potash mines, varying considerably in their depth below the earths surface, are reached by ordinary mine shafts. In sinking these shafts, the utmost care must be taken so that the impervious cap overlying the deposits remain intact, since the salts are readily soluble, and therefore easily washed or leached away. Consequently the shafts are lined with concrete to make the seepage of water impossible. Within the mines, the potash salts are broken down by blasting, as is done in ordinary mining. These blasts tear off large blocks, which are broken up by the miners and transport-

(4.) Johnstone, Sydney, Potash, p. 2.

Cross-Section of the Salt Deposit at

Leopoldshall, Germany.[5]

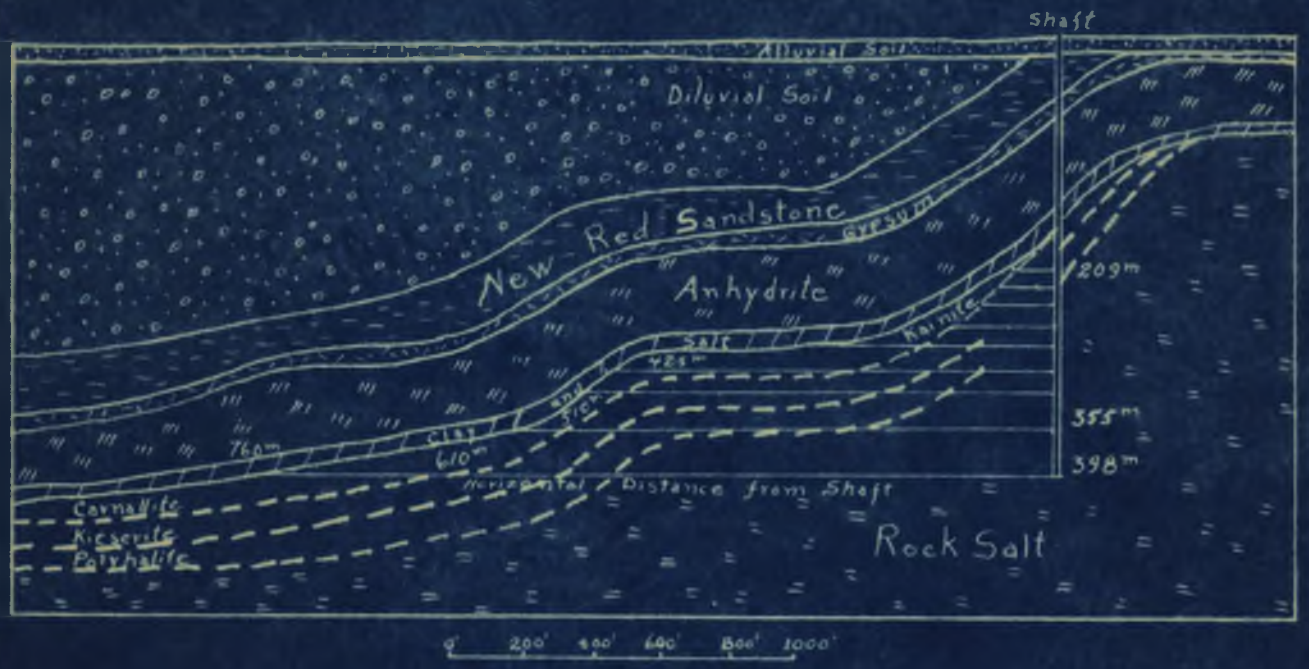

Fig. 2.

(5) Savage, Wallace, The Potash Industry of Germany, Chemical and Metallurgical Engineering, Vol. 19, September 30, 1918, p. 455.

ed in small cars to the shafts where they are hoisted to the surface, and delivered to the chemical works for grinding and for further treatment.[6] Geologically, these potash beds (Permian at Stassfurt and Tertiary at Alsace and Spain) represent the last stage in the evaporation of salt water, presumably sea-water, of a great closed basin, and the peculiar climatic and topographic conditions which caused their formation have been the subject of much speculation.[7] However, this seeming accident of nature has been of utmost value to man, since these salts have made it possible for him to make productive large areas that might otherwise be sterile or, at least, productive of only sparse vegetation.

Uses of Potash. About 1858, through the ceaseless chemical research of Liebig and Francke, it was discovered that the so-called "abraumsalze" at Stassfurt, Germany, could be successfully employed as a fertilizer, and also that it would be utilized in the industries. The discovery of these enormous deposits of potash salts gave the world the first opportunity to secure this mineral in adequate amounts and at a low cost. As a result of well organized and effective propaganda, the use of the fertilizer was stimulated, so that today it has come to be regarded as an essential ingredient of practically all mixed fertilizer.[8] Potash is a plant food, and it is found in all virgin soils, but unlike nitrogen, when it is once exhausted it cannot be replaced by nature.

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(6) The Potash Industry, Potash Importing Corporation of America, p. 12.

(7) Leith, C. K., The Economic Aspects of Geology, p. 113.

(8) Turrentine, J. W., Potash: A Review, Estimate, and Forecast, p. 2.

The potash shortage in the United States during the war led to investigations which proved that the soil in certain sections of the country suffered acutely from potash "hunger". Upon the application of potash in these regions, the crop yields doubled; and it was ascertained, through special test, that no other ingredients could be substituted for potash.[9] However, the amount of potash required by different kinds of plants varies enormously - some as barley and wheat need little, while rye, oats, potatoes, beets, and many leguminous plants, and tobacco need much.[10] Potash is a particularly useful constituent in the building up of worn-out soils, because it contributes materially to the growth of the nitrogen-gathering legumes.[11] It is necessary for the formation of starch and its transfer to various parts of the plant. These conditions increases the resistance of disease in plants, for the application of the potash builds up stronger and more vigorous plants which are better and more able to obtain moisture and food supplies; consequently they will be able to put up a greater resistance and effect a quicker recovery when attacked by disease germs.[12] Clay soils are rich in potash, but often the proportion immediately available for plant food is small, since the potash is frequently in combination with silica, so as to form a compound that will not dissolve in water or do so very slowly.[13]

(9.) Hoar, H. W., Potash; Significance of Foreign Control and Economic Need of Domestic Development, p. 43.

(10) Gradenwitz, Alfred, The German Potassium Salts, Scientific American Supplement, Vol. 80, No. 2084, December 11, 1915, p.372.

(11) Voorhees, Edward B., Fertilizers, p. 92, 93.

(12) Williams, J. C., Potash in Relation to Plant and Animal Diseases, American Fertilizer, January 23, 1926, p. 37.

(13) Groth, Lorentz, The Potash Salts, p. 118.

Because of these characteristics potash is extensively employed on the sandy and peaty soils in Germany, United States, Holland, France, and a few others. In 1913 (See Fig. 3) more than 90% of the worlds production was consumed in this manner.[14] The careful application of potash, or any fertilizer frequently permits a larger yield per unit of ground cultivated, and in consequence it may allow a greater return per man employed on the farm, which would not only mean higher profit, but also a saving of labor - a condition that will become of more and more importance as intensive agriculture becomes more generally employed. But there are various factors that enter when considering the application of fertilizer, as for instance, the character of the soil, whether sand, clay, or loam; the crop to be grown, the cost of the potash, and the price to be received for the crop.[15] Statistics and experiments certainly seem to bear out the fact that a nation which scientifically applies artificial fertilizer will raise larger crops, than a nation which uses fertilizers sparingly or not at all.

Potash in the Chemical Industries. The industrial use of potash is very small when compared with that of agriculture, since only about 10 per cent of the total putput is employed in the chemical industry. However, this use of potash affects us in several ways, since it is necessary in the manufacture of soap, certain kinds of glass, matches, certain explosives, chemical reagents, fireworks, medicines, dyeing, tanning, electroplating, and phptography. These neccessities make an ample supply of potash a vital problem.

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(14) Hicks, W. B., Potash, United States Geological Survey, Mineral Resources of the United States, 1918, Pt. II, p. 399.

(15) United States Tariff Commission, Information Concerning the Potash Industry, p. 10.

Turrentine briefly but vividly sums up its importance in the following quotation: "These (the uses enumerated above) are but a few of the many industries in which potash as a reagent plays an essential role. The small tonnage (see Fig. 3) annually consumed in these industries, as compared with that used in agriculture would appear to be a guarantee against a shortage, even in the greatest emergency; yet during the late war a serious handicap was placed on all these industries by their inability to obtain even the relatively small amount of potash on which they depended. Even the chemist in his laboratory was exhorted to substitute other compounds for potash whenever it was possible to do so. This was an expensive experience which impressed a lesson not soon to be forgotten."[16]

Classification of Salts. The following paragraph will give more detailed information concerning the potassium salts.[17]

Fertilizing salts:

a. Carnallite (potassium chloride) is the most important of the potassium salts, both as regards to quantity and uniformity of distribution. It can be regarded as the basis of the industry. It is sold on basis of 80% KCl.

b. Kainite (double salt of potassium chloride and mag-

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(16) Turrentine, J. W., Potash: A Review, Estimate, and Forecast, p. 173.

(17) U. S. Tariff Commission, Information Concerning the Potash Industry, pp. 20-40.
Hoar, H. M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, pp. 40-50, 60.
Spurr, J. E., and Wormser, F. E., Marketing of Metals and Minerals, p. 488.
MacDowell, C. H., Marketing of Potash, Engineering and Mining Journal, Vol. 117, April 5, 1924, p. 558.

nesium sulphate) is the most important of the secondary minerals in the mines of the Stassfurt district. When it is not too impure, it can be ground and used directly for agricultural purposes. It is the cheapest per ton, but the least pure. It is sold on basis of 12.4 K_2O.

c. Manure salt is a mixture of various crude salts that are used chiefly as fertilizer. It usually enters the market in two grades, sold on a basis of 20 and 30 per cent K_2O.

d. Sylvite (potassium chloride or muriate) is richer in potassium than the carnallite. It is of secondary origin in the Stassfurt mines while primary in the Alsatian fields. It is regarded as the most valuable of the crude salts. When it is mixed with rock salt it is called sylvinite, and in this stage is used more as fertiliser, while sylvite is used more in the industries.

e. Sulphate of Potash - Most agricultural potash in the form of potassium chloride in various concentrations, the diluting material being common salt (sodium chloride) and magnesium chlorides. Chlorides are injurious to certain crops and for these the sulphates are used. It is sold on a basis of 90 K_2SO_4.

Salts used in the industries:[18]

a. Potassium carbonate and Bicarbonate used in the manufacture of soap, Bohemia Flint glass, dyeing and wool

(18) United States Tariff Commission, Information Concerning the Potash Industry, pp. 20-40.

washing.

b. Potassium chlorate is employed where an oxidizer is required, as in the manufacture of matches, and explosive powders.

c. Potassium chromate and dichromate is utilized for the chrome tanning of leather, textile dyeing, printing, and the pickling of brass.

d. Potassium cyanide is used for the extraction of gold and silver from their ores.

e. Potassium ferricyanide (red prussiate of potash) is a powerful oxidizer used for calico printing, and the manufacture of blue print.

f. Potassium ferrocyanide (yellow prussiate of Potash) is essential in the preparation of Prussian blue, dyeing of silk, and the case hardening of iron.

g. Potassium hydrate is employed in the manufacture of soap, and the preparing of caustic lyes.

h. Potassium iodide and iodate are important medicinal and chemical reagents.

i. Potassium nitrate (saltpeter) is the ingredient of ordinary gunpowder.

j. Potassium permanganate is used largely as an oxidizer, but also for bleaching, dyeing of shoe leather, coloring wood deep brown, and as a disinfectant and germicide.

The enumeration of these potassium salts shows a wide variety of uses, and even though the use for fertilizer far surpasses the industrial use, its importance cannot be slighted. In the begin-

ning of the potash industry, the industrial use had forged ahead of the agricultural consumption, in the years preceeding 1880, industry taking most of the potash. But after that date the agricultural chemistry began to use potash, for there was great need to supply potash to the lacking German soils, and following the propaganda brought about by the potash syndicate, the year 1887 marked the date when the agricultural use surpassed that of the industrial.[19]

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(19) Behmer, Carl, Die Entwicklung der deutschen Kaliindustrie unter dem Einfluss der Staatlichen Regulierungsversuche, p.8.

CHAPTER II

THE POTASH INDUSTRY OF GERMANY

The Potash Producing Regions. The potash industry of Germany developed at Stassfurt, near Magdeburg, in Prussian Saxony, Germany, but for over a thousand years before the agricultural use of the potassium salts had been discovered this region had been known for its rock salt deposits. In 1851 two shafts were sunk near Stassfurt with the intention of mining the rock salt, and in the beginning only this salt was utilized, while the overlying salts, known at that time as "abraumsalze", were discarded. However, their presence soon aroused the interest of two eminent scientists of the time - Liebig and Francke - and it was they who discovered that the disgarded "abraumsalz" might be used and sold as fertilizer.[1]

Thus Stassfurt become the center of the potash industry. It was soon discovered, however, that potassium salt beds underlay practically the whole area encircling the Harz mountains. (See Fig. 4) It has been estimated that the reserve content of these entire deposits are in the neighborhood of some 20,000,000,000 metric tons of crude potash salts, which at the present rate of consumption, would be sufficient to supply the worlds needs for a period of 2,000 years.[2] Potash deposits exist in the provinces of Saxony, Brunswick, Hanover, and Anhalt; in the south in

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(1.) Emslie, S. L., The Stassfurt Potash Salts, The Journal of the Society of the Chemical Industry, Vol. 28, April 1909, p. 396.

(2.) Spurr, J. E., Political and Commercial Geology, p. 413

LOCALIZATION OF POTASH GROUPS [3]

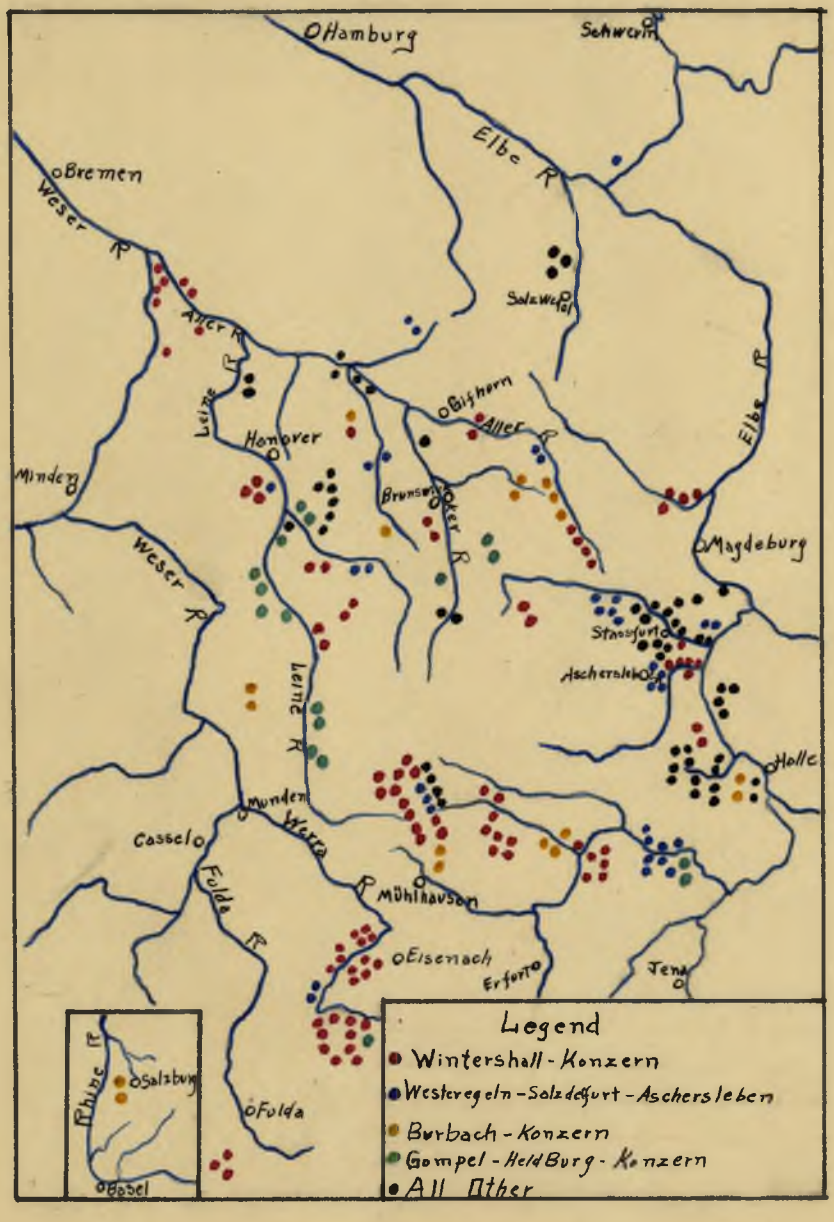

Fig. 4

3. Hoar: Potash: Significance of Foreign Control and Economic Need of Domestic Development, p.35.

Thuringia, and Hessen Nassau; in the north German lowlands; in Jessenitz; and of less importance, at Badan - thought to be a continuation of the Alsatian deposits. However, the regions that might be considered as the chief production centers of Germany at the present time are five in number, namely:[4]

1. The Hanover district
2. The South Harz district
3. The Werra (Thuringia) district
4. The Stassfurt district
5. The Halle, Mansfeld, and Unstrut district

In all of these districts the carnallite layer is the primary salt and it is considered to be the basis of the German potash industry. Besides this there are many other salts almost equally important, of which the most valuable are kainit, kieserite (a salt which is entirely lacking in the Alsatian field), sylvinite, polyphalite, and anhydrite. All of the regions contain also layers, varying in thickness, of the above mentioned salts. The Stassfurt district alone has sixteen different kinds of salt.[5] The importance of the five regions in regard to total output varies from year to year, for the famous Stassfurt region which in 1921 occupied second place, dropped to fourth place in 1922, the position for the year 1922 of these various centers being in the order listed above. (See Fig. 5) This condition is, no doubt, largely due to the falling off or increase of orders of the concerns operating any one of these regions, since the number of shafts in

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(4) Daugherty, Wm. T., Development and Tendencies in the German Potash Industry, Chemical and Metallurgical Engineering, Vol. 28, January 31, 1923, p. 205.

(5) Turrentine, Potash: A Review, Estimate, and Forecast, p. 12.

actual operation does not account for this shifting. (In 1922 Hanover operated 54 our of 79 shafts, South Harz 24 out of 33, Stassfurt 24 out of 43, Werra 14 out of 27, and Halle, Mansfeld, and Unstrut operated 12 out of 29 shafts.[6])

Throughout all of these regions rich and abundant deposits lie near the surface that become richer with depth down to an approximate limit of 5000 feet. It is to be understood, of course, that the beds (some tilted and folded, while others horizontal) vary greatly both as regards to thickness and composition; furthermore, in a great many places the strata is very irregular and ill-defined so that they shade into one another, and in many cases the primary salts have undergone extensive alteration, so that secondary salts frequantly predominate.[7] Of all the districts, probably the most favored from the standpoint of seam structure, of concentration of particular salts and of potash content is the Werra district - this being a comparatively new region as it was first exploited in the nineties.[8] Because of these favorable geological conditions these mines are able to produce relatively cheap potash salts, a factor which is at present playing a tremenduous influence (as explained later) in determining the price policy of the German syndicate. The newest field in Germany that is being exploited is in the Baden region near the Rhine between Guggeingen and Zienken.

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(6) Daugherty, W. T., Development and Tendencies in the German Potash Industry, Chemical and Metallurgical Engineering, Vol. 28, January 31, 1923, p. 205.

(7) Gale, H. S., and Hicks, W. B., Potash, U.S.G.S., Mineral Resources of the United States, 1917, Pt. II, p. 460.

(8) Daugherty, W. T., Development and Tendencies in the German Potash Industry, Chemical and Metallurgical Engineering, Vol. 28, January 31, 1923, p. 206.

The salt is sylvinite similar to that of the Alsatian deposit. However, this area is between the Scharzwald and the Rhine, while to the immediate north is the Kaiserstuhl, whose geologic features confine this bed to a very small territory. Furthermore the 160 meters of overlying river sediments, the thinness of the seam (one to one-half meters thick), and the high temperatures of the mines due to their depth, make this field of much less importance than the other German producing areas.[9]

The discovery and the development of these immense deposits of potassium salts gave Germany the first opportunity to offer to the world this mineral at a low coast, and because of the effective stimulation of sales, a large market was created, so that today this commodity has become a world staple. Geologists assert that there are still huge untapped deposits of potash in Germany.[10] With the enormous production capacity that the German mines already have, and with the possibility of still unexplored beds of salts being discovered, Germany has a natural fertilizer endowment that, so far as is known at present, is not equaled anywhere in the world.

The Organization of the Potash Industry. Germany's success in the potash industry cannot alone be attributed to the favorable natural endowment of this mineral, but partly also, to the technical skill that they displayed in the operation of the mines and in the administrative branch of the industry. From its inception the mine owners endeavored by agreements and mergers to regulate

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(9) Gale, H. S., The Potash Deposits of Alsace, United States Geological Survey, Bulletin, 715, p. 51.

(10) Review of the German Potash Industry, Engineering and Mining Journal, Vol. 118, October 1924, p. 677.

the production and sales in order to prevent the cut throat competition which otherwise was inevitable. However, because of numerous disagreements amongst the operators, and because of the Government's desire to more fully control the potash industry so as to best serve the interests of Germany, the Imperial Government interfered and enacted the Potash Law of 1910.[11] This law not only regulated the industry in Germany, but through its price-fixing provisions was able to charge exhorbitant prices on foreign markets.[12]

However, as a result of the war, higher production costs and Alsatian competition necessitated in 1919 the enactment of a new potash law. This law vested the control of the entire potash industry in the Federal Potash Council (Reichskalirate). Under the provisions of this law the Council is empowered to supervise the industry, fix prices, and issue regulations appertaining to its successful operation. Furthermore, all producers of potash are compelled to enter a union, known as the German Potash Syndicate (Deutsches Kalisyndicate G. m. b. H.).[13] Although the Council manages and controls the industry, the Syndicate has the sole right to sell the potash output - all of which must be placed at its disposal. The holdings of the various concerns are divided into one-thousand parts, each member concern receiving its quota of thousands according to the size and producing capacity. All sales made by the syndicate are divided among the individual mem-

(11) Hoar, H. M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, pp. 4-13.

(12) Hicks, W. B., Potash, U.S.G.S., Mineral Resources of the United States, 1918, Pt. II, p. 398.

(13) Hoar, H. M., Potash: Significance of Foreign Control AND Economic Need of Domestic Development, pp. 26-29.

bers according to their share quotas. This absolutely controls production and sales.[14]

One of the most important recent amendments to the Potash Law of 1919 is the "Stillegungsverordning" (closing-down) act, which provides for the closing down of works that according to the opinion of the Council are unprofitable.[15] Up to date, 118 of the 224 potential mines have been closed down definitely until 1953, and approximately 70 are now fit for operation. Of these 42 are running, while 28 are in reserve. Forth factories are engaged in the refining of the crude salts.[16]

Concentration Within the Industry. The movement of concentration was due largely to the potash law of 1919, but also partly to the critical conditions brought about by the cessation of hostilities and the loss of Alsace. Many of the poorer and less profitable mines have been compelled to shut down, and their production quotas have been acquired by the larger producers, that is, the Wintershall, the Westeregeln-Salzdetfurt-Aschersleben, and the Burbach Concerns, which control roughly 40 per cent, 20 per cent, and 8.7 per cent respectively.[17] (See Fig. 4)

The merging of the mines has, however, brought forth two opposing factions - the Wintershall Group who are large mass producers using large scale production methods and favoring decreased

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(14) The German and Alsatian Potash Industry, U. S. Department of Commerce, Trade Information Bulletin No. 18, p. 5.

(15) American Loan to Tide Over German Potash Industry, Chemical and Metallurgical Engineering, Vol. 31, December 1924, p905

(16) Daugherty, W. T., German Potash Industry Faces Higher Production Costs, Commerce Reports, September 13, 1926, p. 862.

(17) German Potash Industry, The Chemical Trade Journal and Chemical Engineer, Vol. 75, December 1924, p. 783.

prices, and all the other concerns, led by the Burbach and Salzdetfurt-Aschersleben, who oppose this price policy. The Wintershall group have the best mines and works; they have specialized on by-products as well as on the fertilizing salts; and by the operation of these two possibilities concurrently, they are best equipped to undersell all competitors.[18] However, they are prevented by the syndicate system from enjoying open competition. Consequently they are continuing to expand with the probably intention of obtaining a majority control in the syndicate - a position which would permit them to follow out their price policy unimpeded by the other producers. This unquestionably would be advantageous to the consumer.

Nearly 70 per cent of the potash output is now controlled by the three concerns previously mentioned. Nevertheless, these mergers and combinations were not unaccompanied by evil. "It appears that the ways and means offered under the Potash Laws of 1910 and 1919 to divide the insufficient consumption among all works were not suited to bring about sane conditions in the industry. Since it was impossible to compete in different markets, a fight ensued for large quotas in the Syndicate. These could only be obtained by fusion with other works or by the purchase of quotas. In both cases the result was an increase of costs for the leading works which possibly was balanced by the opportunity of using good plants to better advantage. It all depended therefore upon the fusion or quota costing less than the savings effected by the increased production. Only they did the works assuming the extra

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(18) Daugherty, W. T., The German Chemical Industry in 1924, Commerce Reports, March 9, 1925, p. 556.

quota gain in the transaction."[19] The probability is that if free competition had been permitted, the poor works would have been eventually forced to cease operations. As it is now, unproductive mines that have been closed down by action of the Potash Council have to be compensated. Such costs, likewise these accrued by purchase of quotas from the less efficient mines, are ultimately met by the consumer in increased prices of potash.

By-Products. A problem that has always beset the German potash industry is the disposal of the by-products secured in the manufacture of the concentrated fertilizer salts. The carnallite salts, estimated as being about 25 per cent of all the German potash deposits, contain large amounts of magnesium chloride which has a most varied industrial application, as for instance, in the manufacture of flooring materials, textiles, millstones, chemical disinfectants, fire extinguishers, fireproofing woods, and in the artificial ice industry.[20] It is also used commercially as a dust layer on streets, as a spray, as binder in the manufacture of briquets, or as a mineral lubricant.[21] Although in the past the market for the commercial fertilizer has been great, the demand for magnesium chloride has not, and in consequence thereof, nearly 800,000 tons of it and 80,000 - 100,000 tons of magnesium sulfate have been annually going to waste by being emptied into the rivers.[22]

(19) Letter to the writer from Hamilton C. Claiborne, American Consul in Charge, Frank-on-the-Main, Germany, November, 1926.

(20) The German Potash Industry, Chemical Trade Journal and Chemical Engineer, Vol. 75, December 1924, p. 763.

(21) Mansfield, G. R., and Boardman, L., Potash in 1924, U.S. G.S., Mineral Resources of the United States 1924, Pt. II, pp.49-50.

(22) A Problem in the Potash Industry, Chemical Trade Journal and Chemical Engineer, Vol. 76, February 1925, p. 172.

Hence, the recovery of this salt and the extension of its markets constitutes an important problem in the German industry. In 1923 58,000 tons of magnesium chloride were produced, and much more could have been produced if the market had warranted it.[23]

The other rather important by-product salts are Epsom salts, Glaubers salts, bromine, and rock salt. The manufacture of bromine is sometimes referred to as a German monopoly, despite our American and some French (Tunisian) development, Germany produced 1,140 tons of bromine from its potash in 1923, or about twice the amount produced in 1913, as the market absorbs more now than then.[24]

A part of the reorganization that is taking place within the German potash industry is in the development of the by-product industry. As already noted, the Wintershall group is specializing particularly in these non-syndicated by-products and new plants of large capacity are now being constructed to meet the increasing industrial demands for these salts. The concurrence of the chloride and sulphate of magnesia in German potash, as well as the presence of relatively pure rock salt should tend to cheapen ultimate costs to the consumers.[25] Trade Commissioner W. T. Daugherty of Berlin writes that the direct by-products from the German potash mines and the electrochemical products from the waste liquors of potash, and from the sodium chloride present in the potash deposits, will be sold much more abundantly in the export markets in the future.

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(23) The German Potash Industry, Chemical Trade Journal and Chemical Engineer, Vol. 75, December 1924, p. 763.

(24) The German Potash Industry, Chemical Trade Journal and Chemical Engineer, Vol. 75, December 1924, p. 763.

(25) Ibid., p. 763

He furthermore states that the German potash deposits are unquestionably the nearest approach to a monopoly that that country could have in chemical production.[26] Rather interesting is a remark made by the well known Nicodem Caro, of the Frank Caro Cyanamide process: "In the course of time the German potash industry will be the by-product industry, while the salts will be refined preferentially for those chemicals that are now considered chiefly as by-products for industrial uses"?[27] It seems quite logical to assume that with an increasing demand for these by-products a greater production may be anticipated - a condition that would further enhance Germany's leadership in the production of this mineral.

The absence of sulphate in the French salts, as well as scantiness of magnesium chloride (contained largely in carnallite) deprives that country of a profitable by-product industry. The French have no plants for the industrial production of by-products from the potash salts.[28]

Operation. The potash districts, with the exception of the Halle district are all located in agricultural communities, isolated from centers of population. Thus it is the usual thing for the miner to own a small plot of land which he is in a position to work while not in the employ of the mines. The industry is therefore marked by less labor discontent than perhaps any other in Germany.[29] Such a condition is of incalcuable advantage both to

(26) Daugherty, W. T., The Competitive Condition of the German Chemical Industry, U. S. Commerce Repotts, April 1925, p. 23.

(27) The German Potash Industry, Chemical Trade Journal and Chemical Engineer, Vol. 75, December 1924, p. 763.

(28) Ibid., p. 763.

(29) Mansfield, G. R., Potash, U. S. G. S., Mineral Resources of the United States 1924, Pt. II, p. 100.

miner and operator. At the close of 1922 there were approximately 25,000 miners and their helpers employed underground, while 30,000 were at work in the chemical works and in the administrative branch of the industry. Again the concentration of the industry had a marked effect in altering existing conditions, for at the close of 1925 the personnel had been reduced from the 55,000 to 29,000 employees. Two underground crews were employed, each one working a shift of seven and a half hours a day, inclusive of the time taken in entering and in leaving the mines. A wage agreement had been entered into in July 1919, and that has done much to still any labor unrest that existed. Formerly the working underground had been in 9 hour shifts.[30]

The salts are mined by methods similar to the mining of coal, and the costs therefore probably approximate that of coal mining.[31] The cost of sinking the shafts varies greatly, since it depends on the depth and the purity of the deposits, and also upon the degree of danger from the inflow of water into the mines. Because of this latter danger the impervious layer overlying the potash is kept intact, and all precautions are taken to prevent any seepage into the mines. An accident of this sort occurred in one of the German mines in 1912, and officials later reported that the mine was a total loss.[32]

The estimated cost of production per kilogram of actual potash varies somewhat between 8 and 14 marks ($1.90 - $3.33),

(30) German Potash Production and Prices, Chemical and Metallurgical Engineering, Vol. 22, February 1920, p. 341.

(31) United States Tariff Commission, Information Concerning the Potash Industry, p. 9.

(32) Accident at German Potash Mine, Engineering and Mining Journal, July 1912, p. 155.

depending upon the efficiency of the mines. These production costs include wages, which take from 40-50 per cent of the total; power, which requires 8 per cent; heating of the dissolving vats and evaporators from 10-12 per cent; and supplies about 15 per cent. The transportation charges are 9 marks ($2.15) per ton of potash salts from Central Germany to Hamburg.[33] During the time that the French occupied the Ruhr, it was discovered that the brown coal of Germany was an acceptable substitute for the Ruhr coal for use in the potash industry. The coal is very favorable located in Central Germany near the potash mines.[34] The successful use of this lower grade of coal, as well as its accessibility should be a material factor in bringing about the reduction in the production costs of the industry. Prior to 1914 operating expenses of the German mines were low, because much of the product was marketed without further treatment.[35] However, the war brought about a change, and now that the more concentrated salts are employed in agriculture, production costs have indreased.

Production. A picture of the development of the Germanppotash industry may be best secured by a study of Fig. 6. The striking feature presented there is the fact that the increase in production has been quite constant from the inception of the industry till 1914, when the war interrupted the normal growth. One can say, approximately, that the production of the potassium salts doubled every ten years, so that from a very small amount in 1861

(33) Turrentine, J. W., Potash: A Review, Estimate, and Forecast, p. 22.

(34) To Stimulate Use of Potash in Fertilizer, Chemical and Metallurgical Engineering, Vol. 28, April 1923, p. 783.

(35) U.S.G.S., Potash, Worlds Atlas of Commercial Geology, Pt. 1, p. 53.

(2,293 metric tons of crude salts) it rose in 1913 to the enormous figure of 11,607,511 metric tons.[36] The latest figures, 1925, place the production of crude salts at 12,044,239 metric tons.[37]

Before the war Germany produced almost the entire world's supply of potash, since about 95 per cent came from the present German fields, and nearly 5 per cent from the Alsatian mines - then under German control.[38] The amounts obtained from other sources in the rest of the World were so small as to be negligible. (Fig.1) The peak in Germany's production was reached in 1913, but with the outbreak of the war, the industry took a decided slump.

The Potash Industry During the War. In 1915 (Fig. 6) the potash industry reached the ebb in production, since it experienced a decline of nearly 40 per cent of the amount produced in 1913. The factors contributing to this decline were several:

a. The German Government laid an embargo on the exportation of potash, which immediately cut down the export trade.

b. The mines and refining plants were in serious difficulty due to the lack of labor.

c. The lack of labor on the farms depressed agriculture, thus curtailing the purchase of fertilizer.

d. The lack of transportation facilities.

e. Increased production costs.[39]

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(36) Letter to the writer from the Deutsches Kalisyndikat G.m.b.H., December, 1926.

(37) Ibid.

(38) Hicks, W. B., and Nourse, M. R., Potash, U.S.G.S. Mineral Resources of the United States 1919, Pt. II, p. 87.

(39) Behmer, C., Die Entwicklung der deutschen Kali-Industrie unter dem Einfluss der staatlichen Regulierungsversuche, p. 63.

The embargo, however, did not include Austria-Hungary, nor was exportation to Holland and the Scandinavian countries completely cut off.[40] (See fig. 8) This depressed condition of the industry did not long continue, for the blockade of Germany by the Allies quickly stimulated the domestic consumption of fertilizer, as a greater yield per acre had to be obtained to meet the enormous food supply needed by the nation. (It is interesting to note that the war conditions contributed largely to the use in agriculture of more highly concentrated salts, since this involved less agricultural labor.[41]) These factors brought about a steady increase in the production, so that by the close of the war the output had come to within about 80 per cent of the 1913 production.

The Potash Industry After the War. The close of the war brought about the general disorganization in the potash industry of Germany labor troubles, lack of fuel, lack of railroad facilities, and the run-down condition of the refining plants which had been neglected during the war.[42] The domestic consumption decreased practically one-fourth, and as no foreign market had as yet been re-created, the production fell considerably, though not to the degree experienced in 1915. In 1920 the production again increased somewhat, since the returning prisoners gave the needed labor supply, and furthermore, labor had become more stable. Besides, Germany's best pre-war importer - the United States - began to re-open her markets. This prosperity was short lived, for the following year

(40) The German and Alsatian Potash Industry, U. S. Department of Commerce, Trade Information Bulletin No. 18, p. 2.

(41) Behmer, C., Die Entwicklung der deutschen Kaliindustrie unter dem Einfluss der staatlichen Regulierungsversuche, p. 63.

(42) Gale, H. S., The Foreign Potash Situation, Engineering and Mining Journal, Vol. 108, August 1919, p. 236.

brought with it the great world business depression, and the potash industry suffered severely. Because of a large agricultural surplus and decrease in prices in the United States, the demand for fertilizer was greatly reduced.[43] Furthermore, the loss of the Alsatian deposits and the competition of the French and the curtailment of domestic consumption all aided in decreasing the output. As a result many large works sustained losses which threatened their very existence.[44] Domestic price increases of potash were soon balanced by the wage increases. The costs of production in general rose markedly.

1922 marked a return to more normal conditions, and for the first time since the war the consumption of potash exceeded that of 1913. Nevertheless, in 1923 another drop in production took place, due to a lack of operating capital, credit shortage, and the inability of the German farmer to buy. Furthermore, owing to the inflation of the French franc, Alsatian potash carried a price advantage, which increased the French sales to the south German farmers, while it decreased those of the German producers.[45] The industry was in a very precarious position, since both the domestic and foreign sales of fertilizer were low, and the chemical and pharmaceutical branches consumed in very limited quantities.[46] The situation did not improve in 1924. "Aside from a short lived domestic boom at the beginning of the year and a period of slow

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(43) The German and Alsatian Potash Industry, U. S. Department of Commerce, Trade Information Bulletin No. 18, p. 5.

(44) The German Potash Industry, Chemical Trade Journal and Chemical Engineer, Vol. 70, May 1922, p. 632.

(45) Hoar, H. M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, p. 55.

(46) Daugherty, W. T., The Situation in the German Chemical Industry, U. S. Commerce Reports, October 1923, pp. 287-288.

recovery during the last quarter, the year 1924 in Germany was one of financial stringency, general liquidation, and severe unemployment. Local price levels were above world levels, a difference that restricted foreign trade to a considerable extent and reduced domestic consumption. This transition period was unavoidable, as the stabilization of the currency and the balancing of the budget was met by extremely high taxation and a policy of violent credit restriction".[47]

French Competition. Throughout the years following the war, the Alsatian mines were giving the Germans noticible competition. Even with the immediate close of the war concern was expressed in Germany over the apparent loss of their monopoly in this field, for they had anticipated that with this resource they would be able to impose their own terms of peace.[48] With the cessation of Alsace to France, the monopoly was definitely broken, but even then opinion was prevalent that French competition would not bebome serious, for the German producers possessed many advantages, such as:[49]

1. The presence of kieserite, used in the production of potassium sulphate and potassium magnesium sulphate. This salt is absent completely from the Alsatian deposits.
2. Germany has many more mines and refining plants than France.

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(47) Mansfield, G. R., and Boardman, L., Potash in 1924, U.S.G.S., Mineral Resources of the United States 1924, Pt. II, p.47.

(48) Spain a Producer of Potash? Engineering and Mining Journal, August 1918, p. 270.

(49) Daugherty, W. T., Developments and Tendencies in the German Potash Industry, Chemical and Metallurgical Engineering, Vol. 28, January 1923, p. 206.

3. France is hindered somewhat by the occurrence of clay in her deposits.

4. The distance to the nearest harbors is much greater for the French mines than for the German.

But on the other hand, the French deposits also had certain advantages (noted later), and their influence on the world market was very noticible, as proven by the fact that in 1924 the Alsatian works supplied about 12 per cent of the world's potash consumption.[50] In 1925 the production of the Alsatian mines was estimated to be 300,000 metric tons of pure potash. Such amounts cannot be ignored, and unquestionably, this has broken the German monopoly. The foreign markets before the war absorbed about 46 per cent of the German sales, and the loss by Germany of a large proportion of these markets since the war is attributed in large measure to the competition of the French.[51]

Determining factors in the French and German competition in producing the same tonnage of salt are the number of shifts of labor, the amount of fuel and power employed, and the ton miles of haul by rail or steamer. Computated on such a basis, it does not cost any more in man shift and kilowat hours to get a ton of potash salts above the ground in France than it does in Germany; and then when this ton is above the ground, it contains more K_2O on the average in France than it does in Germany. In the long run this gives France an advantage, which is only partially offset by her longer haul to the sea.[52]

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(50) Thewall, J. W., Report on the Economic and Financial Conditions in Germany, Department of Overseas Trade, London, p.162.

(51) German Potash Loses Markets, Engineering and Mining Journal, Vol. 113, January 1922, p. 55.

(52) Teeple, J. E., Alsatian Potash, American Fertilizer, April 1923, p. 66.

Such facts and conditions warrant the recognition of France as a competitor, but nevertheless, Germany is still by far the dominant producer of potash, for in 1925 the estimated production was 1,300,000 tons of pure potash.[53] Germany's resources are greater than that of France and so for all practical purposes no limit to the productive capacity need by looked for. "Germany's capacity for the manufacture of potassium chloride for fertilizer and for further preparation of potassium salts for the chemical and pharmaceutical industry is only limited by the physical ability of its many reducing plants to treat the product from nearby mines where carnallite, sylvinite, hardsalts, etc., of which potassium chloride is the essential constituent, occur in abundance".[54]

Germany's equipment renders her capable of producing much larger quantities than the present market demands. "It will be remembered that Germany's record year of production in all potash salts, 1922, showed an output of about 1,300,000 tons of potash. If this production resulted from the operation of all works at but two-thirds capacity, Germany is capable of producing about 1,730,000 tons of actual potash annually with present plant equipment."[55] The Franco-German pact, (discussed later) has put an end to competition, and in place has stimulated sales. Germany is thus in a position to supply any increase in consumption.

Sales and Distribution. The market supply, in the case of potash, seems always to have been sufficient to meet all demands; in

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(53) MacDowell, C. H., Fertilizer Materials Bulk Large in the World Chemical Markets, Chemical and Metallurgical Engineering, January 1926, p. 11.

(54) Turrentine, J. W., Potash: A Review, Estimate, and Forecast, p. 22.

(55) Ibid., p. 24.

fact, there has always been a tendency toward overproduction in the German mines. It seems safe to assert that the amounts produced in Germany are equal to the sales, for the economic conditions affecting the sales, directly affect the production, causing the increases and decreases in operation as has been discussed under the heading of production. But it is interesting to see the distribution of the sales. A glance at Fig. 7 [56] shows that of the total sales of German potash, the domestic sales in every case exceeded the total exports, and during the war when most of the export trade was shut off, the German consumption was exceedingly heavy.[57] This, of course, was an unnatural situation, and in times of peace and in normal conditions, the export trade nearly equaled the domestic sales. The distribution of the exports before and after the war are graphically illustrated by Fig. 9. The outstanding feature on this map is the fact that the North America (which virtually means the U. S. as far as consumption is concerned) consumes as much potash as the total of all the European countries. Up to the summer of 1914 the world consumed about 1,000,000 tons of potash annually of which Germany used more than one-half, and the U. S. one-fourth - the U. S. consumption thus approximating the total consumption of Europe outside of Germany.[58] A further

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(56) Data 1910 from The Mineral Industry, Vol. 28, p.577; 1911-1912 from the Mineral Industry, Vol. 30, p. 578; 1913-1922 from J. W. Turrentine, Potash; A Review, Estimate, and Forecast, p. 18; 1923 from Mineral Resources of the United States 1923, Pt. II, p. 189; 1924 from H. M. Hoar, Potash: Significance of Foreign Control and Economic Need of Domestic Development, p. 53.

(57) During the war attempts were made by the Syndicate to denaturize the potash, so that it could only be used as a fertilizer and not as an explosive, but the experiment was unsuccessful. Potash Salts, Engineering and Mining Journal, Vol.98, February 1915 p. 349.

(58) United States Geological Survey, Potash, World's Atlas of Commercial Geology, Pt. I, p. 54.

study of the graph reveals that the European consumption was confined almost entirely to the western portion of the continent, with Holland leading in the amounts consumed, i.e., excluding Germany. Comparing the figures for 1913 with that of 1923 the decrease in the exports is most apparent. While the total exports of the potassium salts in 1913 were 514,592 short tons, the exports in 1923 amounted to only 373,352 short tons of K_2O. In that year Germany's consumption was also less than that of the preceeding years. In all, the total sales have decreased by 209,446 tons. The decrease in the American market is really the most preceptible (Fig. 9). Of course, the French market has been lost entirely due to the fact that Alsace is supplying all of its own needs. With the exception of these two markets, the distribution of the German potash sales has not changed materially since 1913.

The sales of German potash to the industrial and manufacturing concerns is only about 10 per cent of the total sales. In 1923 the industries purchased 106,456 metric tons, of which Germany used 68,180 tons;[59] The United States 11,411 metric tons;[60] and the remainder to all the other. Fig. 3 shows that the use of the potassium salts in industry has been comparatively uniform throughout the years, and that while an increase since the depression is evident, the amount used by the foreign industry has increased but slightly, only 9,527 metric tons being used in 1920, while the German usage for the same year was 44,098 metric tons - an increase of 15,832 tons over the lowest point. The pronounced difference

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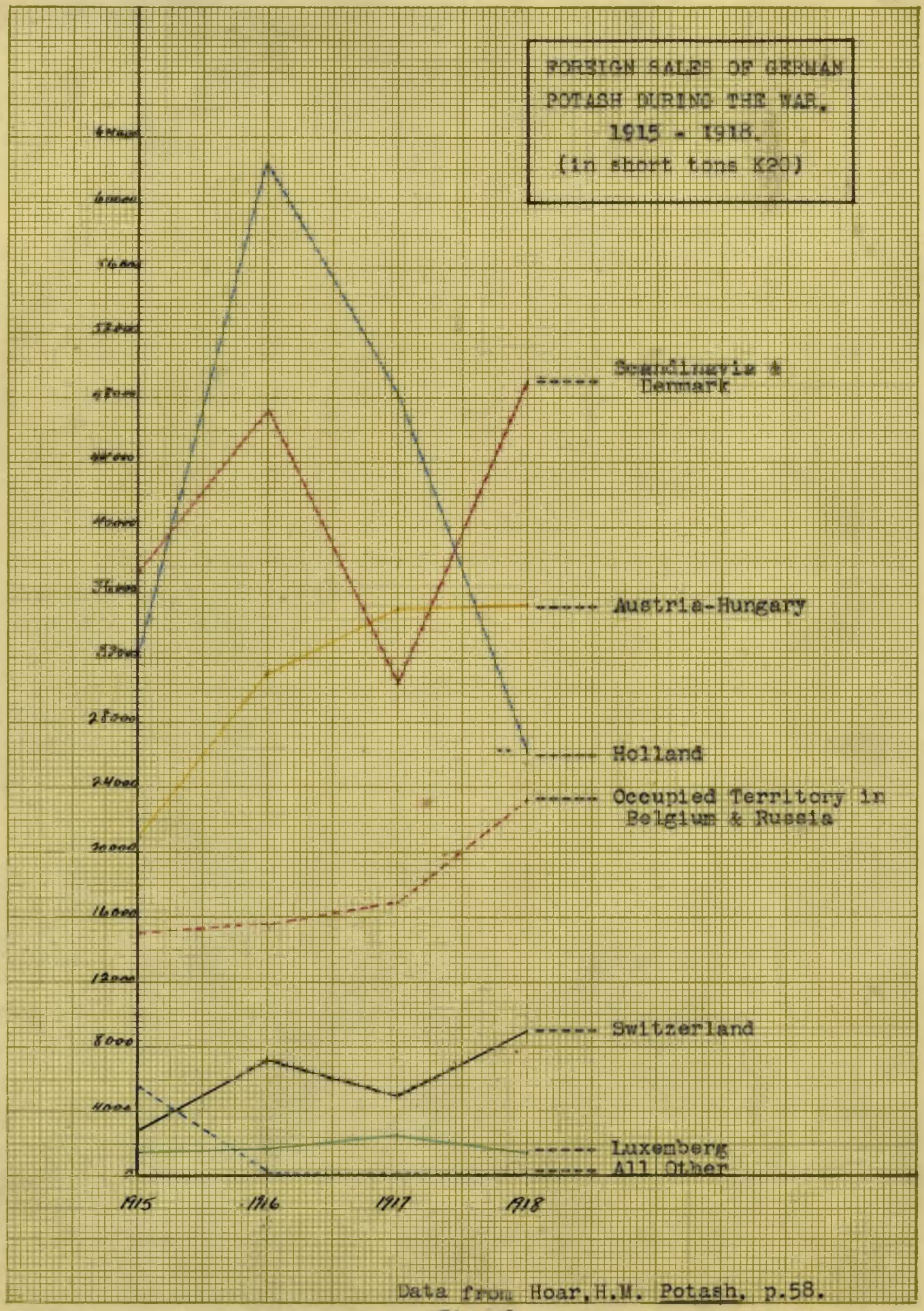
(59) Letter to the writer from H. C. Claiborne, American Consul in Charge, Frankfort on Main, Germany, November} ,1926.

(60) The Potash Industry, Potash Importing Corporation of America, p. 45.



Data from Hoar, H.M. Potash, p.58.

Fig. 8.

between the agricultural consumption and that of the industrial is that the former is increasing progressively, while the latter is consuming but slightly more than it did at the inception of th industry.

The potash industry of Germany was one of the largest of the German Empire and it suffered greatly because of the war.[61] Germany had always been very desirous of increasing the foreign sales of this mineral salt, and consequantly under the law of 1910 a tax was laid by the government on the potash mined with the intention of creating a "propoganda fund" for the purpose of advertising the merits of the German potash at home and abroad.[62] The export trade had always been a most profitable one for Germany, especially as the price discrimination had been in favor of the German consumers. Prior to the war potash made up the highest tonnage of all the products exported.[63] Germany is therefore eager to return to normal conditions, as they recognize that potash must in the future, as in the past, be the corner stone of the export trade. Fig. 7 certainly would seem to indicate that a return to normal conditions would be highly adbisable, since the foreign sales experienced such a severe slump during the war. A favorable balance of trade, and furthermore, a return cargo for the importation of the great number of raw products imported from the United States (Germany's largest importer of salts) would further warrant increased exports.

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(61) German And Alsatian Potash Industry, United States Department of Commerce, Trade Information Bulletin, No. 18, p. 2.

(62) The Mining News, Engineering and Mining Journal, Voll 97, January 1914, p. 203.

(63) Hoar, H. M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, p. 53.

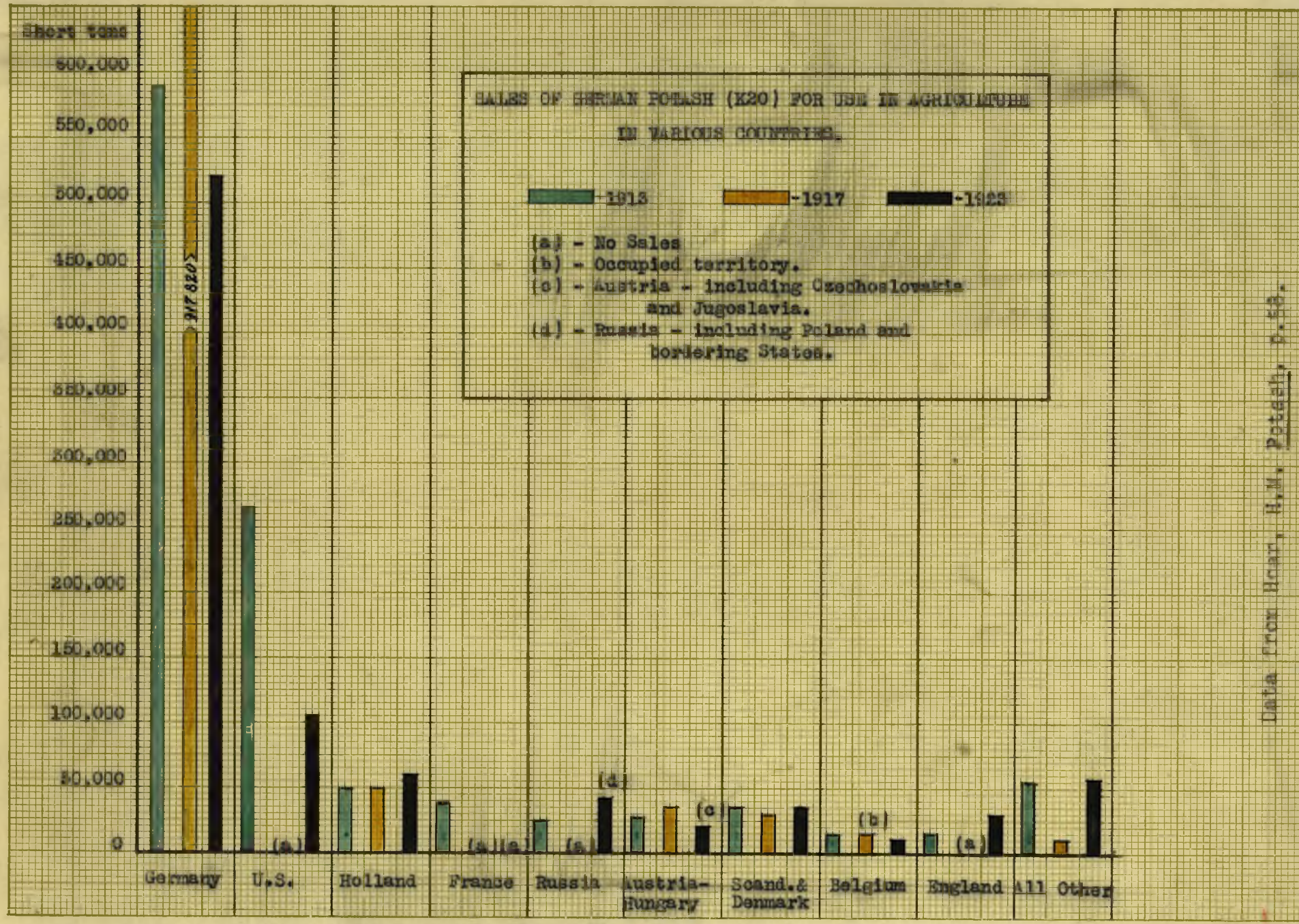
Short tons
800,000
550,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
SALES OF GERMAN POTASH (K2O) FOR USE IN AGRICULTURE IN VARIOUS COUNTRIES.
1913
1917
1923
(a) - No Sales
(b) - Occupied territory.
(c) - Austria - including Czechoslovakia and Jugoslavia.
(d) - Russia - including Poland and bordering States.
Data from Hoar, U.M. Potash, p. 53.
Germany
U.S.
Holland
France
Russia
Austria-Hungary
Scand.& Denmark
Belgium
England
All Other

Fig. 9.

The world is capable of absorbing much greater amounts of potash than it now does, and because of the small amount of production elsewhere both Germany and France should be able to increase their sales steadily.

Since the formation of the Franco-German Pact, anxiety has been expressed on all sides as regards increasing prices and the reestablishment of a monopoly. Charges to this effect were made by the United States Department of Commerce and others to which the German Potash Syndicate replied as follows: "The German Potash Syndicate realizes keenly that its own interests are inextricably bound up with the interests of the farmers of the world. The very size and quality of the German potash deposits and of technical equipment of the German potash mines would render foolish any policy of the German Potash Syndicate which would aim at anything else than the biggest possible increase of potash consumption as a fertilizer throughout the world."[64] It would thus appear that the policy of the syndicate is the earnest desire to increase the foreign sales of their product, and they realize that a fair policy will have to be employed if their industry is to resume great importance. The general outlook for continuously increasing is not particularly bright, for the total sales up to November 1, 1926 amounted to but 935,000 metric tons of pure potash, as compared with 1,109,000 metric tons in the same period of 1925.[65] If the last two months of 1926 fail to bring up the total of sales, it is possible that putput will be restricted. The greatest hope

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(64) The German Potash Syndicate, American Fertilizer, July 10, 1926, p. 34.

(65) Letter to the writer from Hamilton C. Claiborne, Consul in Charge, Frankfurt on Main, November 1926.

for improvement is in the fairly good harvest which may enable farmers to make heavier purchases.[66] However, larger future sales are nearly inevitable, since increasing population will demand increasingiagricultural production, which in turn implies increased use of fertiliser.

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(66) Letter to the writer from Hamilton C. Claiborne, Consul in Charge, Frankfurt on Main. November 1926.

CHAPTER III

THE ALSATIAN POTASH INDUSTRY AND THE FRANCO-GERMAN PACT

Location of Deposits. In 1904, while drilling for oil, potash was discovered in the Department of Haut-Rhin just north of the city of Mulhouse.[1] This region, known as Upper Alsace, is about 20-25 miles north of the Swiss border in the Rhine Valley on the east slopes of the Vosges Mountains and just to the north of the Jura Mountains. The map (Fig. 10) on the following page gives in detail its geographic location.

The area in which the field is located is a manufacturing center, being the seat of large cotton and woolen mills, and in consequence of this industrial development it is well supplied with means of transportation - including railways and canals, the largest of the later being the Rhone-Rhine Canal. This situation is highly favorable to the development of the potash beds, since ample and efficient transportation facilities play a prominent part in the marketing of this rather bulky commodity. Figure 15 shows the relation of this region to ocean ports, and at the same time it shows the position of the French field relative to that of the German fields.

Description of Deposits. When the presence of this valuable potash field was made known, more than 100 borings were made of which 95 penetrated the rock salt, while 17 of them found the potash beds. Within this basin, covering an area of about 68 square miles, the deposits occur in two layers - a richer layer, averaging

(1) Woods, Leslie E., U.S.Foremost Foreign Market for Alsatian Potash, Chemical and Metallurgical Engineering, Vol.29, September 1923, p. 557.

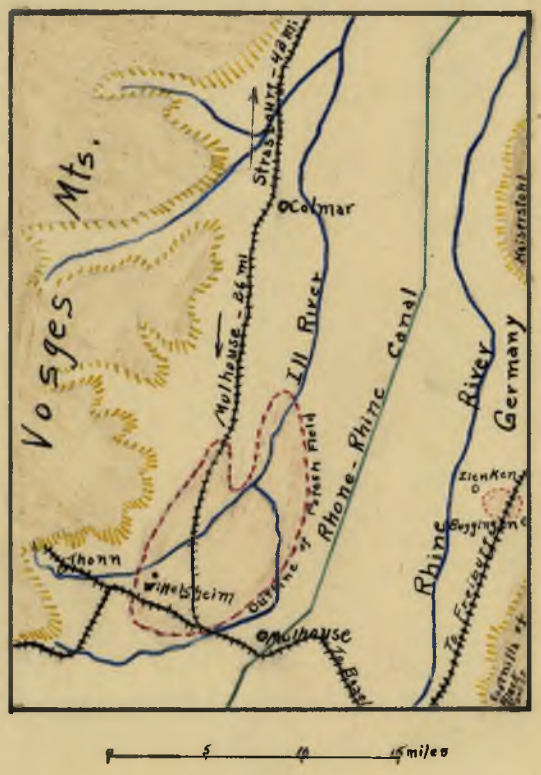

Fig.10

THE ALSATIAN POTASH FIELD

and

RHINE VALLEY IN THE VICINITY OF MULHOUSE[2]

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2. Gale, H.S. The Potash Deposits of Alsace, United States Geological Survey Bulletin 715, p.18.

22-25 per cent K_2O at a depth from 1500-2000 feet with an average thickness of 3.8 feet; a lower layer, about 60 feet below the upper varying in thickness from 7-15 feet with a K_2O content between 15-20 per cent.[3] These beds are chiefly made up of Sylvinite, which is potassium chloride mixed with sodium chloride.[4] (The Buggingen and Zienken field in Baden, Germany, is thought to be an extension of this Alsatian field). In general the field may be divided into a main lower section of salts, relatively free from insoluble material, and then an upper portion consisting of two or three salt bearing layers, divided by shale bands. The mining of the salts is confined principally below this conspicuous shale seam, since it affords a roof for the mines.[5] The estimated total cubic content of this entire field amounts to about 1,472,058,000 tons of salt having a potash content of 22 per cent, or equivalent to about 300,000,000 tons of actual potash, which at the present rate of consumption, would be sufficient to supply the world for 200 years.[6]

The figures just given seem to indicate that this industry is capable of great expansion, and with careful supervision and exploitation, France's position as a producer of potash should become very important. In its production France is limited to this one field, although reports off and on announce the discovery of new fields. A deposit that is considered workable is claimed to have been found at Castagrede, near Salis-de-Biarn in the Pyrennes

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(3) Alsatian Potash Mines, American Fertilizer, September 24, 1921, p. 35.

(4) Societe Commerciale des Potasses d'Alsace, The Alsatian Potash Salts, p. 2.

(5) Gale, H. S., The Potash Deposits of Alsace, U.S.G.S. Bulletin 715, p. 19.

(6) Johnstone, Sydney, Potash, p. 11.

District of southern France. It has been stated that plans for its exploitation are under way.[7] However, it would seem, that there is no great likelihood of new fields entering into the world's potash market for some time to come, for the regions now exploited are more than able to supply all of the world's needs, and because of their natural advantages are capable of producing the salts at comparatively low costs.

Production. The Alsatian mines can really be termed a post war development, for the exploitation of the mines did not begin until 1910, and even them, while under German control, the production was very small. These mines, being under the supervision of the German potash syndicate, were alloted only 4 per cent of the total German production in 1913.[8] Statistics show that before the war only a single Alsatian shaft was completely instaffed - a condition giving it the right to a quota part or a definite allotment of production.[9] The Germans had kept down the production in order to prevent over production and to keep prices uniform. The output continued at about the same level during the war, for the German military control permitted extraction.

Under the treaty of Versailles, the Alsatian deposits owned by the Germans went to the French governemtn, while the Kali Sainte-Therese mines (which had been owned by a French group) continued under private French ownership. In general the damages done

(7) New Potash Deposits in Pyrenees District of South France, Chemical and Metallurgical Engineering, Vol. 32, January 1925, p.158

(8) U. S. G. S., Potash. Worlds Atlas of Commercial Geology, Pt. I, p. 54.

(9) Bonnefon, Charles, Alsatian Potash Industry, Engineering and Mining Journal, Vol. 107, June 1919, p. 989.

by the Germans during the war in the Alsatian mines were not great, except that intensive operation and lack of maintainence had run down the mines to some extent.[10] Other reports stated that the damage done was considerable, and that possibly two years would be necessary to repair the mines.[11] However, the destruction could not have been very serious, for as Fig. 11[12] shows, the output exceeded at once any amount formerly produced. 1919 was a year in which the industry had to be put back into condition and markets had to be established, at home as well as abroad. The German competition during this time was insignificant.[13] The year 1920 was one of great prosperity, due especially to favorable foreign exchanges and to a very advantageous price for the potash exported - the profits were abnormal. But the following year a great slump in the industry took place. The German competition began to be felt together with the consequent lower prices; furthermore, because of the world wide depression, the demand for potassium salts diminished and the scanty reserves of capital made by the industry in the preceding year were rapidly exhausted. But toward the close of the year, the production and sales again rapidly increased, so that by 1922 the industry had reached a new peak.[14] The year 1923 was also marked by a substantial gain, and a steady increase continued

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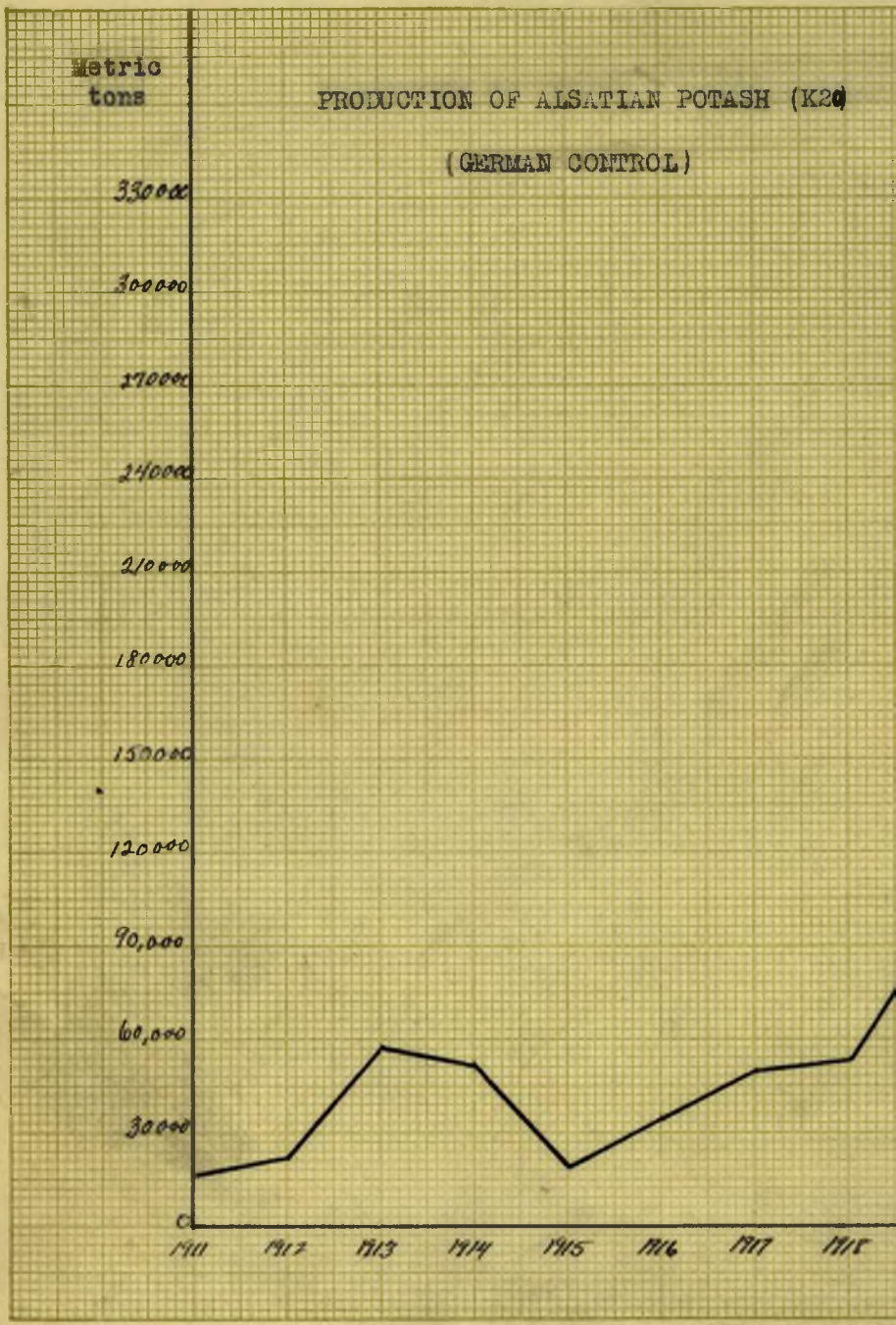
(10) Bonnefon, Charles, Alsatian Potash Industry, Enginneering and Mining Journal, Vol. 107, June 1919, p. 989.

(11) Johnstone, Sydney, Potash, p. 14.

(12) Data on production 1911-1920 from Trade Information Bulletin No. 18; 1921-23 from Trade Information Bulletin No. 305; 1924 from Min. Res. of U. S. 1924, Pt. II, p. 51; 1925 from Chemical and Metallurgical Engineering, January 1926, p. 11. Data on sales from Hoar, H. M., Potash, p. 64.

(13) De Retz, P., Rapport sur le Bassin De Potasse D'Alsace, p. 6.

(14) Ibid., p. 7.


Metric tons
PRODUCTION OF ALSATIAN POTASH (K2O
(GERMAN CONTROL)
330000
300000
270000
240000
210000
180000
150000
120000
90,000
60,000
30000
0
1911
1912
1913
1914
1915
1916
1917
1918

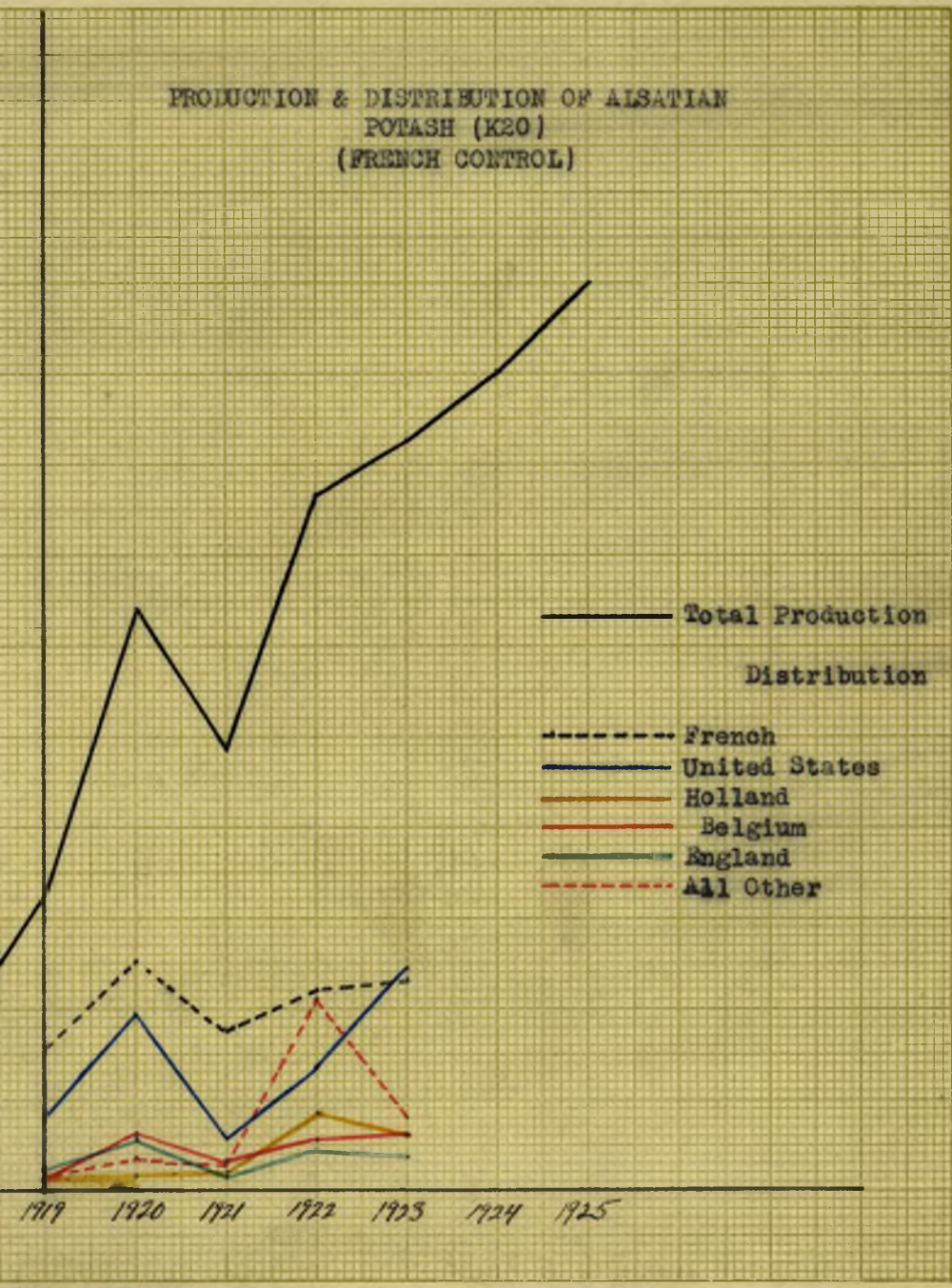

PRODUCTION & DISTRIBUTION OF ALSATIAN
POTASH (K20)
(FRENCH CONTROL)
Total Production
Distribution
French
United States
Holland
Belgium
England
All Other
1919
1920
1921
1922
1923
1924
1925

Fig. 11.

into 1924, whose production would have been larger had it not been for labor troubles.[15] 1925 brought another increase, so that with the exception of the year of depression, the Alsatian mines have experienced a steady growth in their output, an output that rose from 58,000 tons of K_2O in 1913 to 330,000 tons in 1925. (See Fig. 11) The reasons for this increase are summed up by Harper:[16]

1. The geographical situation of the mines is such that shipment of potash is easily accomplished by use of the navigable Rhine River. (In a few years the problem of shipping will be further facilitated by the construction of a canal from the Rhine through the mining district.)
2. The natural richness of the salts. By the selection of material coming up from the shafts it is possible to obtain a salt averaging 30 per cent K_2O, while in other countries refinement is required to reach that grade.
3. The French potash salts are very pure. This eliminates the extra expense of refinement to keep down magnesium chloride.
4. The development of the mines has been conducted on a logical basis with care being taken to avoid sinking too many shafts.

A Further advantage is cited by Hoar, who states that in marked contrast to the German mines, flooding of Alsatian mines does not

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(15) Mansfield G. R., and Boardman, L., Potash in 1924, U.S.G.S. Mineral Resources of the United States 1924, Pt. II, p. 51.

(16) Harper, J. N., The Production of French Potash, Plant Food, p. 2.

entail permanent abandonment.[17]

In regard to the last reason named by Harper, the French say that the number of shafts does not determine whether they can offer competition to Germans in the world market. "The advantage of a limited number of mines is proved by statistics. If we divide the total sales of German potash salts in 1922 by the number of mines in existence, we obtain a figure of output corresponding to 6,140 tons of K_2O per mines If we do likewise with the Alsatian mines, we obtain a figure of output of 13,118 tons of K_2O per mine, which amount is, of course, the real figure of sales from the Societe commerciale des potasses d'Alsace.

One last comparison of figures to prove conclusively the advantageous situation of the French potash mines: When comparing the rates of expansion of the two competitive groups, it is advisable to leave out of consideration the home consumption of both countries in question, namely, France and Germany. (Germanys domestic consumption is many times greater than France) From this point of view, we arrive at interesting facts. In 1922 the Germans exported 331,659 tons of K_2O, while we (the French) exported 158,295 tons of K_2O. If we work out these figures in proportion to the number of existing mines in Germany and France, we must conclude that the French situation with regard to export trade is relatively much better than the German. In 1922 the Germans exported little more than double the French, notwithstanding the fact of their having 12 times the number of mines.

Under normal conditions, the technical power of the French mines will enable them easily to meet German competition;

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(17) Hoar, H. M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, pp. 61-62.

but conditions are not yet normal."[18] However, for the reasons given in detail under the discussion of the Franco-German Pact, France was very willing to come to an agreement with the Germans in regards to the sale of potash, for she possessed several marked handicaps that practically made a sales agreement compulsory. However, it is of fundamental interest to the world at large to know that France is in a position, if necessary, to supply the world, and the statistics of production show her constantly increasing output.

Present Productive Capacity of Alsatian Mines. Since the number of shafts constructed in Alsace are only 17 in number it may be interesting to know their productive capacity. The private owned Kali St. Therese group have four equipped shafts with a daily productive capacity of 2,500 tons of crude salts. The Government Sequestered Mines are able to extract 9,000 tons daily, and this amount could readily be raised to a maximum tonnage of 10,000 to 12,000 per day. A 14,500 ton daily extraction would yield yearly about 4,000,000 tons of crude salts, which is but little, when one considers the richness of the basin, for the extent of the deposits is known to be about 1,800,000,000 tons.[19] With such figures it is quite evident that the productive capacity of the Alsatian mines is sufficient to meet any substantial increase of markets. This only again proves, as also in the case of Germany, that consumption has not kept pace with the production possibilities.

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(18) Mansfield, G. R., and Boardman, L., Potash in 1923, U.S.G.S., Mineral Resources of the United States 1923, Pt. II, p.193

(19) De Retz, P., Rapport sur le Bassin De Potasse D'Alsace, p. 13-14.

New Use of French Potash. Experiments in the past have shown that sodium chloride (common cooking salt) in solution is well adapted to the destruction of wide-leafed weeds, such as tares and charlock, that are found widespread in the grain fields. Similar attempts were made with French sylvinite (potash manure salts, 20% to 30% K_2O) and it was discovered that this was even more effective than the sodium chloride, since the sylvinite also contained large amounts of potash, and thus not only destroyed the weeds, but also increased the vigor and the yield of the cereal. This method of weed and tare destruction in the grain fields has been found to be very successful.[20]

Sales and Distribution. The acquisition of the Alsatian mines by the French immediately brought about the increased production as has been noted, and the French were confronted with the problem of securing a market for their salts. Fortunately, the competition of the Germans was not felt very much during the first year after the war, and this gave them an opportunity to establish themselves in world markets. Outside of their domestic sales, the United States from the very beginning became the principal market for Alsatian potash, and in 1923 the United States consumed more from this district than did France. The other principal countries receiving potash from France are Belgium, Holland, England, and to a less extent Sweden and Denmark, but the total sales to these countries does not equal the amount exported to the United States. The amount sent to Belgium is fairly high, but much of this is re-exported to other countries through Antwerp. However, the amount exported to these countries by Germany far exceeds the

(20) For a more detailed discussion of the subject see L. H Haumont, Discover New Use for French Potash, Plant Food, Vol. 1, No. 4, p. 6.

French exports, as a comparison of Fig. 9 and Fig. 11 reveals. The growth of the exports of Alsatian potash is limited (as also the German) by the agreement entered into by these two nations, dividing the markets in a 69-31 proportion. Consequently the increase in the exports is only brought about by a general increase in demand in the foreign markets, and, as has been stated, both Germany and France are looking toward the United States for larger purchases. The sales of the Alsatian salts is in the hands of the Societe Commerciale des Potasses d'Alsace, which acts as the agent for the Sequestered Mines owned by the Government, and the Kali Sainte Therese mines, the property of private French capital.[21]

Domestic Consumption. The utilization of potash fertiliser in France was by no means equivalent to that of Germany, the United States, or Holland before the war. In fact, the amount when compared especially with that of the United States of Germany is very insignificant. In 1913 approximately 36,000 tons of potash filled the French requirements.[22] But with the acquisition of the Alsatian mines, the domestic consumption increased rapidly so that in 1925 the amount consumed was 120,000 tons K_2O. Such figures seem to reveal gratifying progress, but even so there still is abundant room for further increase. The following table shows this steady expansion:[23]

Year	Tons K_2O
1919	45,000
1920	83,000
1921	60,000

(21) Societe Commerciale des Potasses D'Alsace, The Alsatian Potash Salts, p. 4.

(22) MacDowell, C. M., Potash, Engineering and Mining Journal January 16, 1926, p. 101.

(23) Harper, J. N., The Production of French Potash, Plant Food, p. 3.

1922	74,000
1923	90,000
1924	107,000
1925	120,000

The French are earnestly endeavoring to stimulate the use of fertilizer within their country, and they have offered inducements, such as special bonuses, in order to promote the sales.[24] The tremendous increase in the consumption of potash is largely attributed to the rapid spread of the knowledge of the true value of potash as a fertilizer, and the farmers have come to appreciate the profitable results from the intelligent use of it.[25] The remarkable growth in the production and in both the domestic and foreign sales of Alsatian potash point towards the success of the industry.

The Franco-German Pact. When by the Treaty of Versailles Alsace Lorraine was ceded to France, many expected that the German potash monopoly would be broken, and with French competition, lower prices would result. Others would not concede to France much hope, since the greater size of the German deposits, plus the experience in this field would enable the latter to retain control of the world's potash markets. However, other factors soon entered, which never permitted these two opposing forces to come to a real test of strength.

Soon after the close of the war, it became evident to both the French and the Germans that some sort of agreement between the two with regard to the sale of potash would have to be made. That the French were willing to cooperate is quite conceiv-

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(24) French Potash Position, Chemical Trade Journal and Chemical Engineer, July 3, 1925, p. 15.

(25) Harper, J. N., The Production of French Potash. Plant Food, p. 3.

able for several reasons:[26]

1. The French mines had a much smaller putput than the German mines.
2. The French deposits lacked the sulphatic ingredients, whereas the Germans could build a mighty chemical trade upon the output of the kieserite and the allied salts.
3. Germany would always be in a position to compete with the French abroad.

Furthermore, it seemed apparent to the French that the economic conditions of Germany were continually improving, especially since the return of the latter to a gold basis and the inauguration of the Dawes plan; that therefore open-competition would be a cut-throat proposition - a condition that would seem highly unfavorable to a country that was just launching into this new enterprise. At the same time, the French were endeavoring to attract business at all costs, with the probable intention of securing a favorable quota in case any agreement should later be made with the Germans.[27]

On the other hand, after the war, the German potash syndicate had to contend with the competition with France, which was especially felt in the American markets. This competition was quite evident in the price reductions in all potash exports, but particularly those to Czecho-Slovakia.[28] Price cutting and underselling became so formidable, that finally an agreement was arrived at in 1924 the first Franco-German pact. In this they agreed to

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(26) Rubinfield, J., The Copper, Zinc, and Potash Situation in Germany, Engineering and Mining Journal, Vol. 119, January 10, 1925, p. 76.

(27) Depression in German Potash Industry, American Fertilizer, Vol. 61, July, 1924, p. 58.

(28) Ibid., p. 61.

divide the United States market in a ratio of 62.5 per cent to the German Kalisyndicate, and the balance to the Societe Commerciale des Potasses d'Alsace.[29] However, this agreement was soon terminated and a new one was formed in its place (May, 1925). This pact provided for a three year sales agreement, with the following major conditions, namely, that each reserve for itself its domestic market while the world market should be divided on a basis which would give Germany about 69 per cent and the French about 31 per cent.[30] Further articles of the agreement provided for improvements the opening of new mines, prices etc., but they do not particularly concern us here. "German and French officials emphatically assert that the main object of this new agreement is to expedite the economic marketing of the output, both from the French and German fields to carry on propaganda for the more extensive use of potash in the present markets, to open up others where this fertilizer is yet unknown, and to cut down selling and overhead charges."[31]

However, complaints against this agreement can be heard, especially by the Wintershall group in Germany, who, no doubt because of their mass production and low operating costs, want more unrestricted competition. They contend that there is no justification for the agreement, since it protects the high cost producers in Alsace, whereas the low cost German properties are in position

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(29) Curtis, H.A., Fertilizer: Production Consumption and Trade in Various Foreign Countries, Trade Information Bulletin, No. 305, p. 17.

(30) MacDowell, C.H., Potash, Engineering and Mining Journal, January 16, 1926, p. 101.

(31) Hoar, H.M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, p. 39.

to supply the entire demand.[32] Turrentine apparently also feels that the pact favors the French: "This compact would appear to be highly favorable to the French, inasmuch as the Germans control 221 shafts through which potash may be brought to the surface, while the French control only 17. A comparison between the actual production realized respectively by the two would reflect French advantage again, since the German sales in 1922, the record year, were equivalent to 1,295,600 short tons of actual potash, while the French in 1923 produced only 256,000 tons of K_2O. While this is represented as being only one-half of the production capacity of the French mines, it appears that the actual capacity of the German mines is more than 5,000,000 tons per annum".[33] No doubt, great changes will be made at the expiration of the agreement, while in the meantime at least in the case of the Wintershall group, it will give opportunity for further expansion and enlargement of its organization, and possibly give that concern a majority control in the German Potash Syndicate. It is highly probable that at the termination of the existing agreement the Germans will make strenuous efforts to have their alloted share of the world's potash market enlarged.

The Franco-German combination is one of the most unique in history since it involves a practical monopoly by two nations of an essential raw material.[34] It seems, also to be especially

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(32) German Producers Say Potash Agreement Favors Alsatians, Chemical and Metallurgical Enginnering, Vol. 32, January 1925, p.88.

(33) Turrentine, J. W., Potash, The Mineral Industry, Vol. 33, p. 592.

(34) Concannon, C. C., Potash in World Trade, American Fertil- October 2, 1926, p. 29.

directed toward the United States, as it is the largest foreign consumer of potash and it is expected to take increased amounts in the future. Probably because the Franco-German Pact desires to stimulate sales in the United States, or probably also because they may fear that any discrimination against them will act as an impetus to domestic production within the United States, the prices of potash in that country have been kept low. In fact, the prices are lower now than they were in 1913, as Fig. 12 shows. MacDowell says, "This combination as yet has worked no hardship on the buyer and is the one outstanding instance of foreign monopoly where sales price has been kept on a reasonable basis".[35] However, it is well to keep in mind the extent of this new monopoly created by the Franco-German Pact. The German and the Alsatian mines at present produce 95 per cent of the world's potash, amounting to about one and a quarter million tons of pure potash a year. Of this 40-50 per cent is exported, of which the United States takes about 60 per cent (approximately 275,000 tons K_2O, valued at about $12,000,-000 annually)?[36]

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(35) MacDowell, C. H., Potash, Engineering and Mining Journal, January 18, 1926, p. 101.

(36) Concannon, C. C., Potash in World Trade, American Fertilizer, October 2, 1926, p. 39.

CHAPTER IV

MARKETING AND TRANSPORTATION, PRICES, AND A BRIEF WORLD SURVEY OF THE OTHER SOURCES OF POTASH

Marketing and Transportation. The increasing costs of production and marketing that have been experienced the world over, has also affected the potash industry, not as regards to the sale price, but as to the kind of salt marketed. Formerly kainite, a low grade salt averaging about 12 per cent K_2O, had been the most common salt used for fertilizer. It is a bulky commodity, but because of the very low freight rate accorded it before the war by the Government-controlled German merchant marine, freight charges were not a serious matter, and consequently the bulk of fertiliser exported to Germany's principal market, the United States, was in this form.[1] Also, in the United States, the inland freight charges before the war were not so high, and consequently it was not a burden upon the consumer. But even before the war and more especially now, the lower the percentage of potash in the potassium salts and the further the distance it was carried, the higher was the cost per unit of potash to the consumer.[2]

The war increased both the ocean and the rail rates, and very largely because of this an increasing effort is being made to concentrate the raw salts before they are shipped. The freight rate is now an important consideration, for the potash is sold on

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(1) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 169.

(2) Williams, J., Unit Values in Potash Fertilizer, Chemical Trade Journal and Chemical Engineer, Vol. 69, November 1921, p.823.

a basis of analysis, while the freight is paid on the basis of bulk and weight.[3] Concentration of the salts has increased the potash analysis, while it has decreased the bulk. It seems, therefore, that with more intensive agriculture and increased high freight rates, the use of concentrated fertilizer will no doubt be extended.[4]

Comparing the location of the Alsatian field with that of the German, Fig. 15, the first thing noticed is not only the greater extent of the German fields, but also their greater proximity to ocean ports. Both France and Germany have a network of railroad lines and canals, which provide quick and efficient transportation of potash to local markets and to the ocean ports. Transportation costs are vital in determining the selling price of potash, since it is bulky, and because of her greater proximity to

(3) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 170.

(4) It might be well and also interesting to know the principal potassium salts used as commercial fertilizer. They are:

Salt	Purity in per cent.	Sold on basis (in per cent)	
Muriate of potash	80-85	80KCL	.....Potassium Chloride
Sulphate of potash	90-95	$90K_2SO_4$	.....Potassium Sulphate
Double Manure salt	48-53	$48K_2SO_4$	.....Potassium Sulphate
Manure salt	30	$30K_2O$	.....Double salt of Magnesium and Potassium Chloride
Manure salt	20	$20K_2O$	..... " " "
Kainite		$12.4K_2O$	.....Mostly Potassium Chloride

The German and the French salts are all marketed under the above headings, with the exception of the French Kainite, which has a 14 per cent K_2O content, and a purely German product, Sulphate of Potash Magnesia, 44-53 per cent purity, and sold on a basis of 48 per cent K_2O. MacDowell, C.H., Marketing of Potash, Engineering and Mining Journal, Vol. 117, April 1924, p. 558.

the sea, Germany, other things being equal, could market her product cheaper than France. For instance, the charges per ton of salts in car load lots from Strassbourg and the Rhine to Antwerp is 25.85 francs, to Dunkirk 38.05 francs, and to LeHavre 41.80 francs.[5] For a similar tonnage of potash, the transportation charges from Central Germany to Hamburg is only 11.09 francs.[6]

Fig. 10 showing the setting of the Alsatian potash field in greater detail depicts the relation between their deposits and transportation facilities. It shows that the region is well supplied with the State Railway and also the Rhone-Rhine Canal which extends to Strassbourg, a distance of about 70 miles from Mulhouse. The usual route for the export of Alsatian potash is by rail to Kehl, the river port opposite Strassbourg, and by river boat thence to Dortrecht, Holland. From here the potash is towed without charge by the Belgian Government to Antwerp, where the salts may be transshipped to any foreign country.[7] Rail connection may of course be had to other ports or to any other part of Europe.

The routing of German potash for oversea export is largely by the way of Hamburg, Bremen, and Lübeck, through whose ports in 1925 passed approximately 45, 35, and 8 per cent respectively of the total.[8] The distance from the German deposits to these ports is the average about 150 miles[9] compared to 375 miles from

(5) Mansfield, G.R., and Boardman, L., Potash in 1924, U.S.G.S. Mineral Resources of the United States 1924, Pt. II, p. 52.

(6) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 27.

(7) Letter to the writer from G.S. Messersmith, American Consul General, Antwerp, January, 1927.

(8) Letter to the writer from Wm. Coffeir, American Consul General, Berlin, December 1926.

(9) Spurr, J.E., Political and Commercial Geology, pp.413-414.

Strassbourg to Rotterdam), and both canals and railways are used.[10] It seems fairly obvious that Germany has in this case a decided advantage over France.

Prices of Potash. Nothing could more strikingly show the highly monopolistic character of the German potash industry before the war than Fig. 12.[11] (Prices of, muriate, for example, which in 1914 had been in the neighborhood of $40.00 per ton in the United States rose to a maximum of $500.00 per ton during the war years.) As is shown in the graph the prices on the American market rose to a point nearly ten times that prevailing before the way. Prices are the determining factor in regulating the amount of sales. For instance, in the British House of Commons recently, the Minister of Agriculture was asked whether he could give an estimate as to the amount of potash that would be used by the farmers for fertilizing purposes if large quantities could be obtained from German in the form of reparations. To this the reply was given that the amount of potash that could be profitably employed depended entirely on the price of agricultural produce.[12] Thus if the fertilizer prices are too high to meet the ability of the farmer to purchase, the amount of fertilizer sold will be limited. To decrease prices, means to stimulate sales. The low prices that existed immediately after the close of the war were due to extraordinary conditions such as depreciated currency, and the complete stagnation within the home market resulting in price concessions to foreign nations

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(10) Letter to the writer from the Deutsches Kalisyndicate, G.m.b.H., Berlin. December 1926.

(11) The graph is drawn on the basis of unit price which is the price per ton divided by the percentage of potash. It is based on importations and prices in the United States, since they were the largest consumers.

(12) Parliamentary News. Chemical Trade Journal and Chemical Engineer, Vol. 75, April 1923, p. 520.

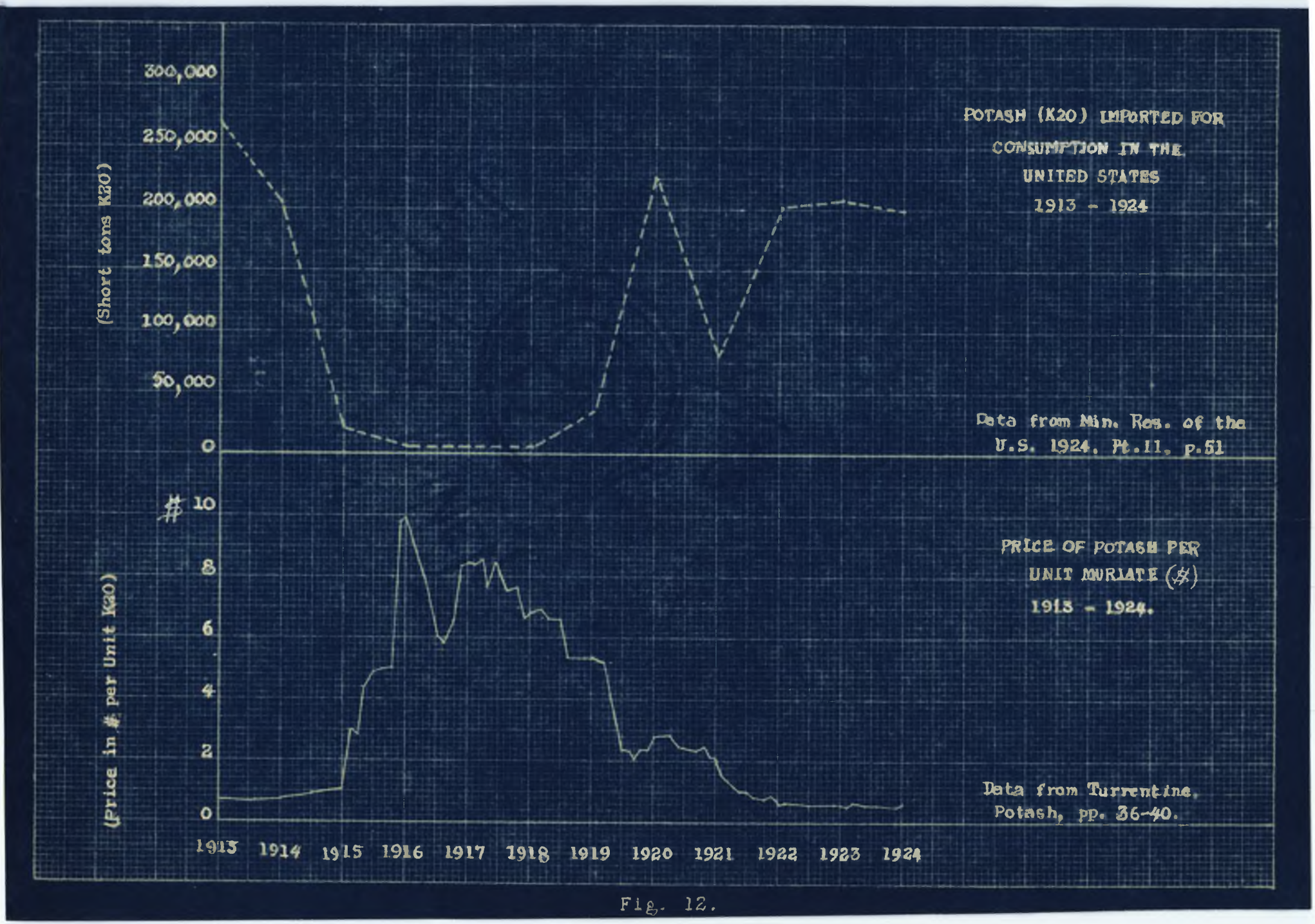
300,000
250,000
200,000
150,000
100,000
50,000
0
(Short tons K2O)
POTASH (K2O) IMPORTED FOR CONSUMPTION IN THE UNITED STATES 1913 - 1924
Data from Min. Res. of the U.S. 1924, Pt.11, p.51
10
8
6
4
2
0
(Price in # per Unit K2O)
PRICE OF POTASH PER UNIT MURIATE (#) 1913 - 1924.
Data from Turrentine, Potash, pp. 36-40.
1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924

Fig. 12.

to stimulate sales.[13] To this was added the competition of France, which further reduced the sale price.

However, we are more concerned with the normal conditions. But here too, several factors enter that make for reduced prices. The possibility of American and other sources of production no doubt influences the prices of potash. The United States, for example, produces less than one-tenth of its annual consumption, but the possibilities of expansion - especially in the Searles Lake district in California - doubtless has a restraining influence on present potash prices. The crying need in Germany and France is a wider consuming market, and the policy of the French and German syndicates seem to tend toward reasonable prices to encourage increased world consumption.[14] Prior to the war the German syndicate was compelled by law to sell potash to the German farmer at prices considerably lower than those intended for export. At present, however, domestic and foreign rate is practically the same.[15]

Developments within the German potash industry also point toward reduction of prices. The Wintershall concern, controlling, it will be remembered, about 43 per cent of the total production, has stood for a decrease rather than an increase in prices. It seems fairly obvious that very great economies could be realized if the mass production of the Wintershall group could predominate - utilization of the best mines at full capacity, intensive production, elimination of overhead by the closing of the less productive

(13) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 35.

(14) MacDowell, C.H., Fertilizer Materials Bulk Large in World Chemical Markets, Chemical and Metallurgical Engineering, January 1926, p. 11.

(15) MacDowell, C.H., Potash, Engineering and Mining Journal, January 16, 1926, p. 101.

mines, and the increased manufacture of by-products. This policy would compel the less efficient mines to close, and the market would then be supplied from the best sources at minimum cost. Advocates of this policy claim that such reorganization would be able to place potash on the American market at a figure 35 per cent below the present prices.[16]

In the past few months, however, price agitation in Germany has been on the increase. The following conditions account for this situation:

1. Indebtedness of the entire potash industry which is estimated to be 450,000,000 to 500,000,000 marks.
2. The concentration movement has been costly as the syndicate had to enter the world's money market for a loan of $75,000,000 repayable in 25 years at 7 per cent interest.
3. Sales for 1926 seem to be tending downward - amounting to 733,666 metric tons of pure potash in the first half of 1925 as compared to but 601,000 metric tons for the same period in 1926.[17]

Recently a proposal to increase the price of potash was made by certain members of the syndicate.[18] However, higher prices were vetoed by the Council, because they believed that it was wrong to establish a precedent by allowing the leaders of an industry with private capital to shift the losses entailed by over-capitalization, as it has been in the case of the potash industry. This over-

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(16) Turrentine, J.W., Potash, The Mineral Industry, Vol. 33, p. 594.

(17) Daugherty, W.T., German Potash Industry Faces Higher Costs, U.S. Commerce Reports, Sept. 13, 1926, p. 662.

(18) Ibid., p. 662.

capitalization had taken form in the fusion and purchase of quotas, and the construction of works which can now, for some reason or other, no longer find a market.[19]

It seems to be the opinion of some, though, that the present low prices of potash are not likely to continue, for the agreement between the German and French producers has eliminated that competition, and a gradual rise in wages is taking place, both tending to induce increased prices.[20] Nevertheless, up to the present, the prices of potash are still below the pre-war level, which seems to be a good indication of a fair policy adhered to by the French and German syndicates.

The Potash Industry of the United States. Before the war the United States was one of the largest consumers of German potash, and like the rest of the world it had been almost wholly dependent upon this source for its supply. During the first 15 years of the twentieth century the American potash industry was practically non-existant. In 1911, because of the increases in prices of potash due to the German monopoly, Congress provided for investigations of the possible sources of domestic potash by both the Geological Survey and the Bureau of Soils.[21] Thus at the outbreak of the war the potash deposits of Searles Lake, California, the Nebraska lakes, alunite deposits of Utah, the kelp beds of the Pacific coast, the leucite rocks of Wyoming, and the greensand deposits of New Jersey were all known. No production before the war had been re-

(19) Letter to the writer from Hamilton C. Claiborne, American Consul in Charge, Frankfurt on Main, Germany, November 1926.

(20) Turrentine, J.W., Potash, The Mineral Industry, Vol. 33, p. 596.

(21) Past and Present of American Potash, Engineering and Mining Journal, Vol. 118, November 1924, p. 854.

ported and the United States had its beginning in 1914 when at Long Beach, California, production of potash from kelp on a small scale began.[22]

When in 1915 the Germans placed the embargo on the exportation of potash, the United States imports fell from 207,089 tons of pure potash in 1914 to 7,957 tons in 1918[23] (See Fig. 13)[24]. Prices of potash within the United States rose enormously (See Fig. 12). However, the war and the embargo stimulated the development of domestic sources of potash, and in this country many plants sprang up - 128 in number - manufacturing potash from the salt lakes; as a by-product from the manufacture of sugar, cement, and steel, and also small quantities from kelp, wool-washings, wood ashes, and distillery wastes and also from the insoluble minerals. The total amount produced for that year was about 55,000 tons of pure potash, nearly one-fourth of our pre-war consumption.[25] Of this amount the natural brines furnished about 73 per cent, kelp 9 per cent, with smaller contributions from the other sources.[26] (Much interest is centering around the western Texas region where a discovery of potash in 1912 has led to experimentations as to

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(22) Hicks, W.B., Potash. U.S.G.S., Mineral Resources of the United States 1918, Pt. II, p. 400.

(23) Mansfield, G.R., and Boardman, L., Potash in 1924. U.S.G.S. Mineral Resources of the United States 1924, Pt. II, p. 31.

(24) Data on importation 1910-1919 from Mineral Resources of the United States 1919, Pt. II, p. 85; 1920-1924 from Mineral Resources of the U.S. 1924, Pt. II, p. 31.
Data on production 1915 from Mineral Resources of U.S. 1918, Pt. II, p. 386; 1916-1924 from Mineral Resources of U.S.,Pt. II, p. 28.

(25) Past and Present of American Potash, Engineering and Mining Journal, Vol. 118, November 1924, p. 854.

(26) Hicks, W.B., Potash, U.S.G.S., Mineral Resources of the United States 1918, Pt. II, pp. 286-287.

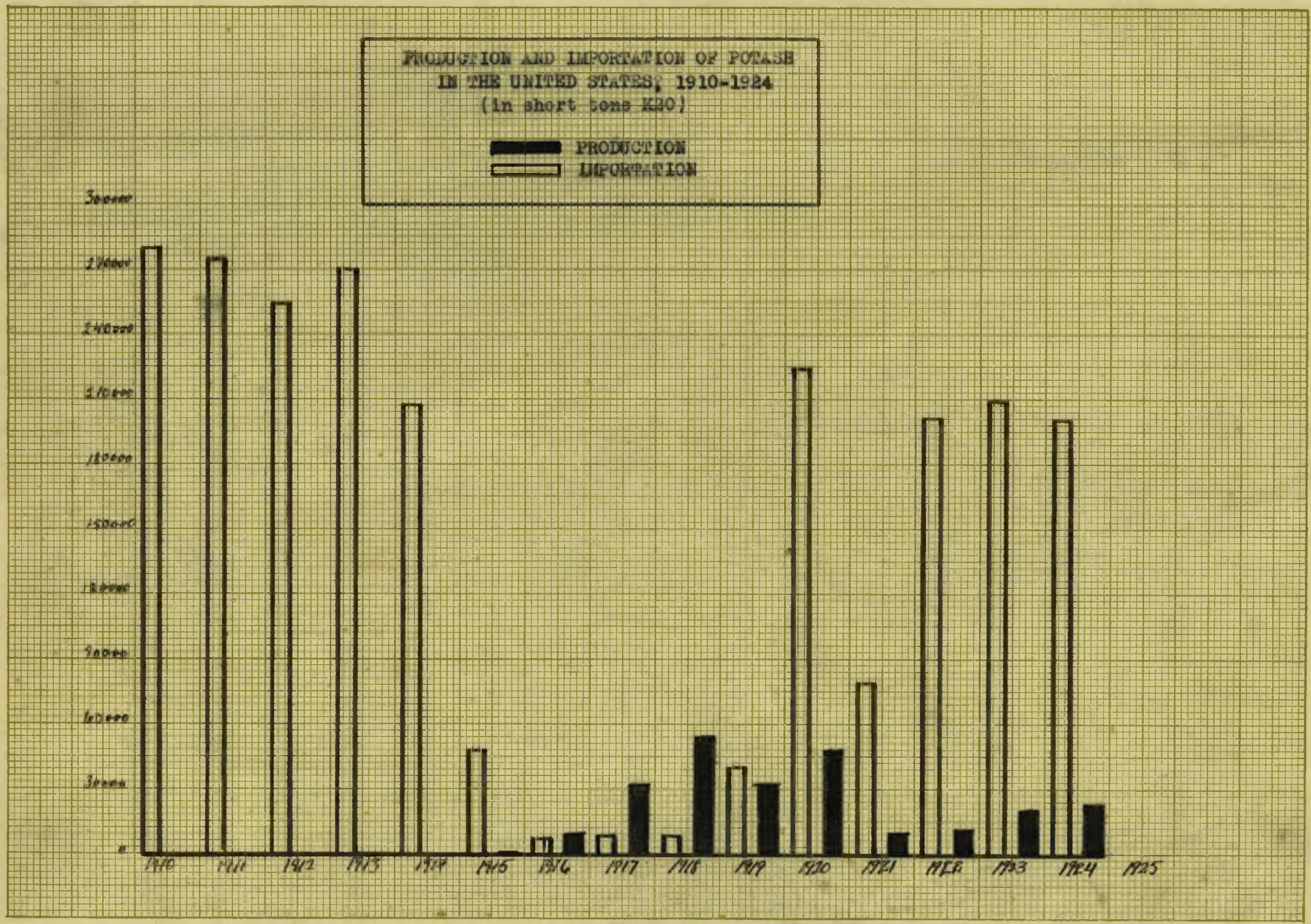
PRODUCTION AND IMPORTATION OF POTASH
IN THE UNITED STATES, 1910-1924
(in short tons K2O)
PRODUCTION
IMPORTATION
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925

Fig. 13

its value. Hopes of securing potash from this field are being entertained, but as yet no quantitative information is available, for little is known about the thickness, quality and extent of the deposits.[27]

Post-War Situation. The United States potash industry suffered greatly at the close of the war, for cheap, abundant foreign supplies of potash were anticipated. At once the demand for the home product ceased and the stocks of the producers accumulated to such an degree as to threaten bankruptcy.[28] The price fell to $2.50 per unit - a price lower than the cost of production for many producers and as a result many of them had to close their plants. By the early part of 1919 nearly all producers had shut down and some of them had gone out of business entirely.[29] Fig. 13 shows the marked deflation of the industry after the war, and such a trying economic test as these manufacturers faced was a test, it seems, of whether or not the processes of securing potash were profitable during peace-time conditions. Further, the general business depression, the disorganized condition of the world as a whole, and the high freight rates aided in the decline of the American industry. Agitation by manufacturers for placing a tariff on the importation of potash or by creating a government subsidy was defeated, and largely through the opposition of the consumers, as they felt that they would have to pay the burden indirectly in higher prices of

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(27) Mansfield, G.R., and Boardman, L., Potash in 1923, U.S.G.S. Mineral Resources of the United States 1923, Pt. II, p.179.

(28) Phalen, W.C., Potash Salts in 1919, Engineering and Mining Journal, Vol. 109, January 1920, p. 228.

(29) Hicks, W.B., Potash, U.S.G.S. Mineral Resources of the United States 1918, Pt. II, p. 401.

domestic potash. The question is whether the potash independence is worth the price of a government subsidy or higher prices because of a tariff? The last session of Congress appropriated $100,000 per year for five years to be used in determing the distribution and extent of potash within the country.[30] This seems to be a method of precaution, so that, in case conditions should again arise as during the late war, the United States would not experience such a complete shortage of this essential fertilizer. The fields existing in this country would at least be known and in times of stringency might be readily exploited.

The American Trona Corporation. The increase in the production since 1921 is due largely to the operation of the Trona Corporation. "In the United States the only operation on a large scale is at Searles Lake, California, where a production equivalent to 20,000 tons of potassium oxide has been won from the brine and disposed of in competition with foreign potash, and at a price which has shown a profit. This in spite of the fact that transportation costs to the Middle West and South represent a large percentage of the total sales price. One factor in its success has been the production and sale of important by-products and the high grade of the potash. The quality of the American potash is recognized as the equal of foreign potash for both agricultural and chemical purposes".[31] Another source of by-product potash is the United States Industrial Chemical Company whose production in 1925 amounted to

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(30) Potash Prospecting in the United States, Engineering and Mining Journal, July 31, 1926, p. 161.

(31) MacDowell, C. H., Potash, Engineering and Mining Journal January 16, 1926, p. 101.

3,000 tons of pure potash.[32] Other sources of supply in the United States are negligible, since the estimated production for 1925 was but 24,000 tons of pure potash.[33] The preceeding statistics should be ample to warrant the statement made by J. W. Turrentine, that "Among the conclusions which may be drawn is the definite one that potash produced from known American sources must be yielded as a by-product, or with by-products, if it is to compete with foreign potash. The reason is obvious; it must be produced at a lower cost than is possible if it is to be produced alone from any of the raw materials so far exploited. Therefore, it is essential that the potash problem be attacked from the view-point of obtaining with the potash, other products of commercial value."[34] The extent and the value of the other known potash sources in the United States are still to be further investigated. At least, much more knowledge of many of these sources has to be gained before any promise of future production can be made.

Importation and Consumption. The sales of foreign potash in this country and the price quotations are controlled by the Potash Importing Corporation of America pepresenting the German Syndicate, and the Societe Commerciale des Potasses d'Alsace representing the French potash producing interests. The apportionment of the sales between these two countries as regards the United States market had already been noted. Although the total consumption of potash in

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(32) MacDowell, C.H., Fertilizer Materials Bulk Large in World Chemical Markets, Chemical and Metallurgical Engineering, January 28, 1926, p. 12.

(33) Ibid., p. 12.

(34) Turrentine, J. W., Potash: A Review, Estimate and Forecast, p. 48.

the United States is large, (See Fig. 13) the amount used per cultivable area as compared with Germany or Holland is remarkably low, and for this reason it is likely that our consumption in the future will increase.[35] Consequently the foreign producers are looking to the United States as their best field for increased sales. The consumption of potash in the United States in 1925 for the first time exceeded the pre-war level, being estimated at 300,000 short tons of K_2O.[36] A steady growth of consumption is anticipated.

Further, as regards consumption, it is interesting to note that the territory south of the Mason-Dixon line and the Ohio River and east of the Mississippi River consumes most of the fertilizer material; hence the South Atlantic ports, including Baltimore, and the Gulf ports are principal points of entry for the imported potash. New York serves as the chief port for the Middle Western and North Atlantic agricultural sections, although a little passes through Boston. The chemical potash enters largely through the North Atlantic ports, and it is consumed in the manufacturing plants along the seaboard from Baltimore north to Boston, or is distributed to the chemical manufacturing industries along the Great Lakes.[37]

From the evidence now known (small production and with no definite information on hand as yet as to future potentialities) it is quite apparent that the United States will not in the immediate future become a competitor in the potash market. The low

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(35) Concannon, C.C., Potash in World Trade, American Fertilizer, October 2, 1926, p. 29.

(36) MacDowell, C.H., Fertiliser Materials Bulk Large in the World Chemical Markets, Chemical and Metallurgical Engineering, January 26, 1926, p. 11.

(37) MacDowell, C.H., Marketing of Potash, Engineering and Mining Journal, Vol. 117, April 1924, p. 557.

price at which foreign potash is available has not only curbed the American production created during the war, but it will tend to discourage the launching of any new enterprises. Foreign producers now appear to be aware of this. "During early postwar years German fertilizer manufacturers feared rising interest in chemistry in the United States. It seemed to them very probable that American ingenuity would develop cheaper methods of producing inorganic fertilizers. This fear has now greatly abated. German manufacturers know that, with rapidly increasing population, American demands for fertilizers will increase steadily each year, and they hope to supply the increasing requirements through the development of their own industries."[38]

The Spanish Deposits. The discovery of potash in Spain was made in 1912 in the Province of Barcelona, in Catalonia, in the northeastern corner of Spain.[39] Near Suria and Cordona, which lie in the valley of the Cordona River, the first borings were made, and nearly all of these reported that carnallite and sylvinite were in fairly regular beds - the carnallite zone, containing workable beds three meters or more in thickness and averaging 12 per cent potash (K_2O); and a sylvinite zone of two or more meters thick with a 20 per cent potash content. Souh evidence was sufficient to warrant further exploration and justified the creation of a company to work this property.[40] It is estimated that in the Suria district the potash beds occupy an area of not less than 3,500

(38) Foote, Walter A., The German Fertilizer Trade Recovering, Commerce Reports, November 30, 1925, p. 511.

(39) Gale, H. S., Potash Deposits in Spain. U.S.G.S., Bulletin 715A, p. 1.

(40) Ibid., p. 10.

hectares (8,648.8 acres) having a potential production of 200,000,-000 tons of pure potash.[41] A later peport is much less favorable maintaining that the amount of potash in sight in the Spanish deposits is too small to be of international importance. Estimates for the area prospected placedthe quantity of carnallite at 2,550,-000 tons and of sylvinite at 1,150,000 tons.[42] The mines are not easily worked, since the deposits are not as regular, and they are somewhat more steeply inclined than those at Stassfurt.[43] Added to these difficulties is that of the possible inflow of water, for the beds lie, as stated, in a river valley.

Predictions and estimates of the importance of the Spanish field, however, are really of very little significance, it seems, and really nothing can be affirmed of its potentialities until their products have come upon the market. Sveral companies have been formed, and a number of galleries and surface buildings are under construction. A railroad has been built connecting Suria with Manresa in order to get direct connection with Barcelona, where a quay has been constructed to handle the outgoing potash.[44] At the present time there is only one company, backed by Spanish and Belgian capital, in operation, and only a few thousand tons have been produced. However, the producers of Spanish potash believe that by 1926 they will be able to compete with Germany and France

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(41) Hoar, H.M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, p. 65.

(42) Johnstone, Sydney, Potash, p. 21.

(43) Ibid., p. 21.

(44) Mansfield, G.R., and Boradman, L., Potash 1924, U.S.G.S Mineral Resources of the United States, 1924, Pt. II, pp. 55-56.

in the world markets.[45] This is questionable.

The Spanish Government has interfered greatly in the industry, for in 1918 they promulgated a scheme similar to that of Germany, making concessions for mining and the sales of potash subject to governmental control, fixing prices for domestic and foreign consumption, and setting the maximum and minimum production for each mine.[46] The accepted opinion is that the restrictions that have been imposed by the Government have inhibited progress and development in the industry, for if the estimates of the deposits are correct, practically no other reason than political bias and jealousy could be responsible for such a lack of development. However, it may also be due to the fact that the war and post war agitation exaggerated reports, and that with the cessation of this propaganda, the importance of this field will subside. "From the facts known at present it is impossible to conclude that the Spanish potash deposits will have any significant influence on the world potash situation, other than that represented by the loss of the Spanish potash market to the present German-French group of producers".[47] So as regards Spain, one can only speak of her in terms of potentialities. It is a field that may be developed and should, therefore, be kept in mind.

Potash Development of Poland. The potash deposits of Poland have been known for some time, but under the Austrian Government

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(45) Concammon, C.C., Potash in World Trade, American Fertilizer, October 6, 1926, p. 26.

(46) Ibid., p. 25.

(47) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 33.

little had been done toward developing these deposits, for between the years 1900 and 1913 only 170,000 metric tons of crude salts had been produced. The potash districts are in Kalusz, Stebnik, Drohobyez, and Stanislawow in Galician Poland.[48] The salts in these regions occur as kainite, sylvite, and a layer of carnallite, The deposits on a small scale resember those of Germany, and explorations indicate the presence of several hundred thousand tons of potash.[49] The production since 1913 is given in the following table:[50]

Year	Kainite	Sylvite	Total Production
1913	2,344	------	2,344
1921	182	15,392	15,511
1922	2,520	43,562	46,082
1923	22,128	39,375	61,503
1924	23,545	57,875	81,420

Thus it is evident that Poland's potash industry is virtually a post war development. "The Austrian policy under the influence of the German Potash Syndicate never encouraged development of mines in Galicia. About 60,000 tons were mined in the first quarter of 1926, and Poland's intensive agricultural program will demand increased supplies. Prior to the war, Poland used 400,000 metric tons, nearly all imported."[51]

The rapid progress in the mining of the potash is mainly

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(48) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 38.

(49) U.S.G.S., Potash, Worlds Atlas of Commercial Geology, Pt. I, p. 54.

(50) Turrentine, J.W., Potash: A Review, Estimate, and Forecast, p. 39.

(51) Concannon, C.C., Potash in World Trade, American Fertilizer, October 2, 1926, p. 28.

due to the credit facilities accorded by the government and to the large increasing domestic demand for this particular class of fertilizer that is present in these deposits.[52] From the table on page it is very evident that the reserves in this field are insignificant when compared with those of Germany or France, and they will probably never enter into world competition because of their limited extent, but they may later produce sufficient to supply domestic needs, and in this manner affect the French and the German producers, i.e., through a loss of a market. "It is safe to say that the continuous development of this industry will result in freeing Poland from dependence on German potash, as the output will be able to cover the entire domestic demand. Of course, this statement is only true as far as present requirements are concerned, and these are very far from the standard of a rational and intensive agriculture. If the use of fertilizers in Poland were as intensive as in Germany, then Poland would have to produce at least two million tons of potash salts per annum to fill her own requirements. In that case the existing mines could not satisfy her needs, despite the fact that the Polish deposits are very rich. But with new capital it would be quite feasible to satisfy the whole demand.[53] This illustrates one of the numerous cases in which a nation is trying to develop its own resources of potash, instead of being entirely dependent upon Germany or France for its supply.

Italy's Sources of Potash. Italy has for some time been producing potash from the insoluble mineral rocks, alunite and leucite,

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(52) More Potash Mined in Poland. American Fertilizer, October 30, 1926, p. 66.

(53) Ibid., p. 66.

and as the case with many of these minor potash industries, it had its origin during the war. Extensive deposits of alunite are found near Tolfa, Italy, and they yield several hundred tons of potash alum annually. Italy is thought to have about 8,000,000,000 tons of potash in the leucite rocks distributed widely through the country, but unfortunately it is combined with silica, and it is therefore almost certain not to compete with the German and the Alsatian potash.[54] Attempts to make potash from leucite has met with some success, but up till now it is still far from supplying the home market. Fig. 1 shows the insignificant part that this industry plays in the production of potash. Predictions are always plentiful, for even in Italy it is claimed that their potash industry will soon be able to compete in world markets. "Research and development work in leucite lavas are being made with such success that it is claimed Italy will, in a few years, be in a position not only to fill its own potash requirements, but also to export in large quantities this essential product."[55] As in the case of all the minor and less extensive sources of potash, it seems to be very unlikely, however, that they will be able to compete with the enormous deposits of Germany and Alsace.

Russian Deposits. Little information in regard to the Russia potash situation is, of course, available. Hoar states that she has developed a sunflower industry in the Kuban district from which she obtains the potash. The sunflower acreage for 1924, amounted to 540,000 acres, as against 887,000 acres under cultivation in

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(54) U.S.G.S., Potash, Worlds Atlas of Commercial Geology, Pt. I, p. 54.

(55) Hoar, H.M., Potash: Significance of Foreign Control and Economic Need of Domestic Development, p. 69.

1917. The 1924 acreage realized approximately, 10,000 tons of potash.[56] Really very little reliance can be placed on the reports coming from Russianas regards the potash deposits that are said to have been discovered. It was stated in 1917 that considerable deposits of potash had been located by a scientific expedition near Solikamsk, in the Perm district, and different accounts credit it with varying amounts of potash content.[57] Very little information is available as regards its value or its extent. It seems that Russia really does not warrant consideration when evaluating the potash sources.

Situation in other European Countries. None of the remaining European countries produces potash other than in a few minor local places, as for instance in England, where attempts have been made to secure potash from blast furnaces; from the ashes of marine animals as in Scotland; from the kelp ashes as on the Irish coast and from cement plants as in Sweden. But when it is remembered that the German and the Alsatian mines alone produce 95 per cent of the world's potash supply, the insignificance of these sources can be understood. All of these countries and others without any question, it seems, are dependent on outside sources for their potash fertilizer.

Non-European Sources. With the exception of the United States, there are few other sources that may be considered as even potential producers, let alone actual. However, it may be interesting to note that Abyssinia has deposits of potash thought to be comparatively rich. This deposit occurs in Dallol, in the southern

(56) Homr, H. M., Potash:Significance of Foreign Control and Economic Need of Domestic Development, p. 73.

(57) Johnstone, Sydney, Potash, p. 15.

part of Dancalia, about 46 miles inland from the Red Sea and about ten miles from the Italian frontier of Eritrea.[58] This is a barren and waterless area, and this fact, plus the lack of transportation facilities will, no doubt, prevent this region from being worked as long as other dheap and aundant supplies are available.

Many other minor local sources produce potash in various ways, as has been listed in the first chapter, but as they do not as yet play any part in world markets nor promise to do so in the future there existence may be ignored.

Resume. Fertilizer is economically important in two respects:

1. It restores to the soil certain of the plant foods with the harvested crop.
2/ It is a labor saving device, for it enables the farmer to raise more produce per given unit of labor.

The former is all-important from the standpoint of growing population, for unquestionably more intensive methods of cultivation will be necessary to supply the ever-increasing demands. Thus the use of potash as a fertilizer is not only advisable and practical, but also very essential. From the material point of view, the consumer of potash increases the returns for his labor, and at the same time releases labor from the farm to be employed elsewhere. The use of potash in both cases is fundamental.

Potash, in one form or another, is abundant and practically all salt deposits contain it, but in a few places unusually rich potash deposits are found, and these localities furnish practically the entire world's output. The approximate distribution

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(58) Johnstone, Sydney, Potash, p. 23.

of potash deposits according to present knowledge is as follows:[59]

	Character of raw material	Approximate % of potash (K_2O) in crude salts	Potash in Reserve in tons of K_2O.
Germany	salt	15	2,000,000,000
Alsace	salt	22	300,000,000
Searles Lake, Cal.	brine	7	20,000,000
Spain	salt	15	530,000 (a)
Nebraska	brine	25	500,000 (a)
Abyssinia	salt	24	200,000 (a)
Galicia	salt	10	40,000 (a)

(a) Estimate indefinite and inconclusive.

With this table as a guide, it is not at all surprising that the figures for the world's production of potash should be distributed as follows:[60]

Total production in world (K_2O) 1925 - 1,600,000 metric tons (Approx)

Germany	1,225,500 metric tons
France	310,000
United States	30,000
Poland	25,500

No other information, than the above, need be given in order to substantiate the statement that the world at present is dependent for that essential soil ingredient, potash, upon two nations - Germany and France. While formerly the monopoly rested in one country, it is now unevenly divided between two - a position that by effective cooperation might arbitrarily enact an embargo (in case of abnormal conditions, such as war) that would temporarily, at least, cause potash starvation throughout the world. Such is the world's situation in regard to its potash supply, and in spite of the potential development of the present known reserves, Germany and France, will no doubt, dominate the potash market for every long

(59) Hicks, W.B., Potash, U.S.G.S., Mineral Resources of the United States 1918, Pt. II, p. 402.

(60) Daugherty, W.T., German Potash Industry Faces Higher Production Costs, Commerce Reports, September 13, 1926, p. 563.

time.

As regards consumption, Fig. 14 definitely illustrates that but a slight increase has taken place since 1913, and furthermore, that the proportionate increase for all the countries consuming has been the same. France possibly is an exception, for the acquisition of the Alsatian mines has greatly stimulated domestic consumption. If the World War had not interrupted the normal growth of the potash industry, it is practically without doubt that the consumption in 1925 would have been twice that of 1913. That consumption has not kept pace with productive capacity is evidenced by the fact, previously mentioned, that of 70 shafts in Germany declared fit for operation by the Potash Law of 1919, only 42 were in actual operation in 1925.

A COMPARISON OF THE GERMAN AND FRENCH POTASH FIELDS AS REGARDS NUMBER OF SHAFTS AND PROXIMITY TO OCEAN PORTS.

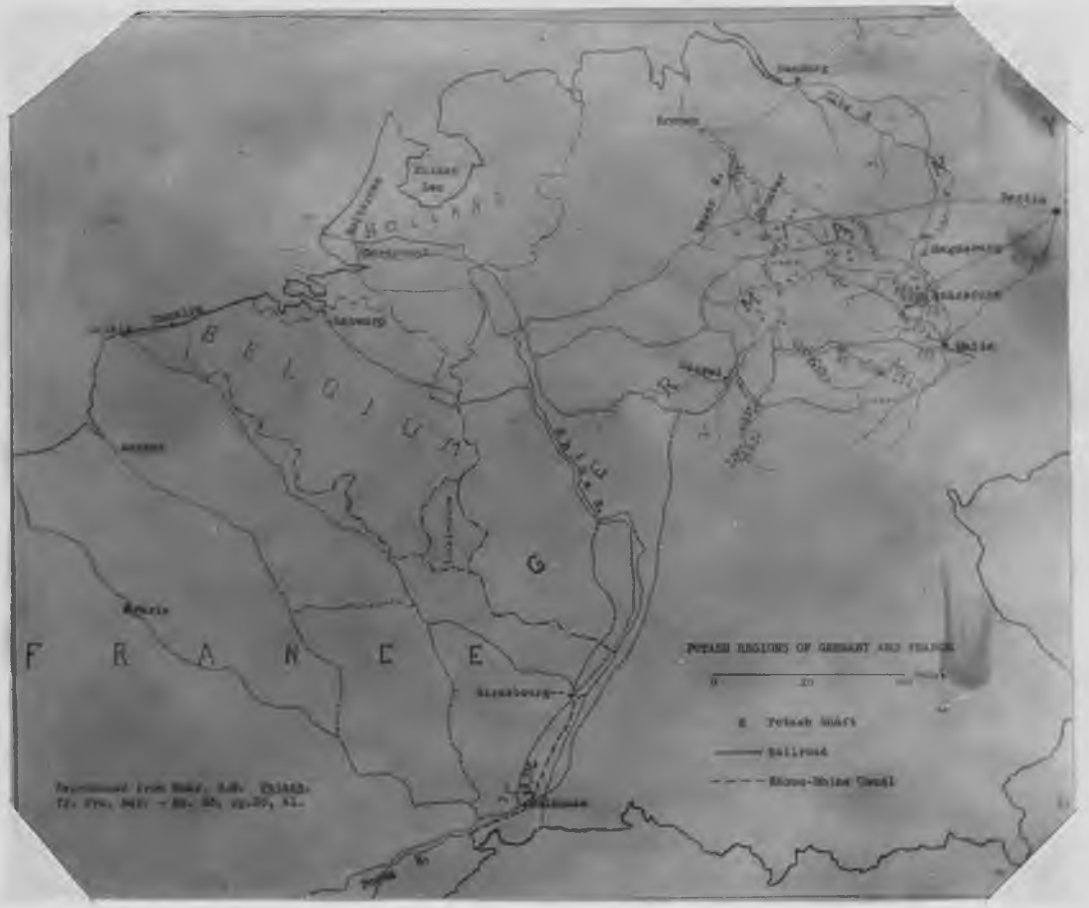

Fig. 15

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